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MODEL AIRPLANE NEWS

48120 April 1993

THE WORLD'S PREMIER R/C MODELING MAGAZINE

OT HOW TO'S

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- oldering Gear and Servos
- Crosswind Sailplane Launches
- CG Placement
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APRIL 1993 VOLUME 121, NUMBER 4

MODEL AIRPLANE NEWS

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***ABOVE**: Charlie Nelson's YKS Waco Cabin is shown on the wing at the recent Scale Masters. (Photo by Rich Uravitch.)*

***ON THE COVER**: Mark Frankel's F4D-1 Skyray ducted fan is captured in the air by ace jet photographer Tony Nunez. Is this your next jet project?*

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EDITORIAL

TOM ATWOOD

YOUR VOICE IS NEEDED

In December of '92, Ray Kowalski, an attorney working for the AMA, notified the AMA's Frequency Committee and the Frequency Advisory Council (comprised of members of the R/C Manufacturers Association) that a "Notice of Proposed Rule Making" (NPRM) published by the FCC threatens, if approved, to jeopardize the use of two-thirds of our R/C airborne frequencies. The tolerances proposed would allow signals from 1W mobile transmitters to overlap with 31 of our R/C frequencies.

The AMA, in coordination with the R/C Manufact-urers Association and a host of industry figures, quickly put together a program to meet the initial deadline for responding to the NPRM. The primary weapon in this struggle is a grassroots mailing campaign from modelers; that's right—a personal letter from you.

The giant electronics/communications companies that are looking for new frequencies obviously have substantial clout. An overwhelming avalanche of letters from modelers to Congress and to the FCC can also exert tremendous influence, particularly since a new administration is now taking the reins. *If you have not already written such a letter, please do so now! Let your voice be heard—ASAP—before the next phase in the FCC's decision process has been completed ("Reply to comment" period ends in April '93).* A draft letter is reprinted at the top of our "Airwaves" column. Below is a reprint of the initial AMA notice that was distributed in January.

URGENT FREQUENCY ALERT!

To all users of model frequencies in both the 72 and 75MHz bands:

The Federal Communications Commission (FCC) has issued a "Notice of Proposed Rule Making" (NPRM—PR Docket 92-235), which, if implemented, will have a profound effect on model frequency use. Developed by the FCC Land Mobile Service, it creates a massive frequency restructuring—the first of its type in 60 years.

The 419-page document addresses frequency use in another service (Part 88), but it will *also* affect Part 95 where our R/C frequency use lives. Without becoming too technical, the restructuring inserts

Jay Mealy of the AMA (left) presents Model Airplane News advertising manager Sharon Warner and editor Tom Atwood with an industry associate program certificate at the IMS show in Pasadena, CA. The program promotes cooperation between industry members and the AMA.

two new frequencies between those presently assigned for modeling use and commercial users. That means we could have a transmitter almost four times the power output of ours, only 2.5kHz away from a large number of our 72 and 75MHz frequencies.

In the 72MHz band, 31 of our frequencies would be bracketed, principally in the lower end of the band (below channel 42). A similar condition would exist in the 75MHz band. An example of the frequency placing would look like this:

Model channel 14	72.070MHz
New insert	72.0725MHz
New insert	72.0775MHz
Present commercial	72.080MHz
New insert	72.0825MHz
New insert	72.0875MHz
Model channel 15	72.090MHz

Not only are these new frequencies very close to ours, but they are also designated as "mobile." Therefore, we would never know where they are operating—right in the pit area at your field or on the street and highway nearby. In addition, the technical specifications for the new equipment allow a legal frequency tolerance that could place their signal directly *on* ours!

What can be done to address this situation? The Academy, with full industry support, will pursue all avenues available through the legal counsel they retain to represent modelers before the FCC. The first step in that process is the filing of formal comments prior to February 26, 1993. Other steps will follow.

We have been strongly urged to use "every arrow in our quiver" to address this proposal. You and your club members are very important "arrows" who can help us make our point! You are being asked to write *now* to those persons and agencies in the federal government that *represent you!*

Send your letters to:

- FCC, 1919 M St. NW, Washington, D.C. 20554.
- Your senator: the Honorable [name], U.S. Senate, Washington, D.C. 20510.
- Your representative: the Honorable [name], U.S. House of Representatives, Washington, D.C. 20515.

(For the name of your senator or representative, contact the Capitol switchboard at (202) 224-3121.)

In writing your letters, it is important to do the following:

1. Include the identification of the proposed rule making: PR Docket 92-235.
2. Personalize your concerns: "I am retired and derive many hours of pleasure

(Continued on page 129)

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Senior Editor	CHRIS CHIANELLI
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AIRWAVES

WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Airwaves," **Model Airplane News**, 251 Danbury Road, Wilton, CT 06897. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous numbers of letters we receive, we cannot respond to every one.

YOUR VOICE IS NEEDED

The following draft letter—to be mailed to your senator and/or representative—was prepared at the AMA as a general guide for all who wish to contribute to the worthy cause of protecting our radio frequencies (please see "Editorial," this issue). Though your letter may be shorter or longer, skim the draft to see the ideas that are presented. If you write only one letter this year, make this the one.

TA

DRAFT LETTER...

...to your senator or representative regarding FCC rule making

Begin with a description of your interests, e.g., I am retired, and derive many hours of enjoyment from constructing and operating radio-controlled model airplanes; or, I have been interested in aviation for as long as I can remember. I am very active in a local club whose members enjoy constructing and operating radio-controlled model airplanes.

I am very concerned about proposed rules that are currently under consideration by the Federal Communications Commission (FCC). The proceeding is PR Docket 92-235. If adopted, the new rules will greatly reduce the usability of frequencies currently assigned for model use and increase the risk of accidents and attendant liability for controlling model airplanes.

Our radio-control frequencies are in the 72 to 76MHz band. This band is primarily used for private, land, mobile-dispatch operations. However, our radio-control frequencies in this band are far enough apart from the land mobile frequencies that we have been able to share the band without either use interfering with the other.

Now the FCC wants to create more land mobile frequencies by splitting them into narrower band widths and rearranging the band plan. As a result, many land mobile frequencies will move closer to the radio-control frequencies and cause interference to radio-control operations. I am told that, of the 50 frequencies that are presently available for radio control of model airplanes, only 19 frequencies will be left if these new rules are adopted.

When we fly our model airplanes under radio control, we go to great lengths to ensure the safety of the operators and bystanders and the protection of property. Many of our safety precautions involve the careful coordination and use of the radio-control frequencies. If the number of usable frequencies is diminished as proposed by the FCC, the remaining frequencies will become congested, and the margin of safety will be greatly decreased.

Please understand that many model airplanes have wingspans up to 10 feet and weigh as much as 30 or 40 pounds. The models themselves are expensive to build, but—more to the point—they are capable of causing property damage, serious injury, or even death if radio interference causes the operator to lose control of the craft. We often fly our models at organized events and contests where hundreds of operators participate. We need the use of our full complement of radio frequencies to ensure a safe flying environment.

I do not think it is wise of the FCC to seek to improve the operating conditions of land mobile radio users at the expense of radio-control modelers. The FCC may not think we are as important as business users of radios, but we have a considerable investment in our models and in our radio equipment. The hobby provides many hours of enjoyment to thousands of people like me and contributes to the advancement and development of the commercial aviation industry.

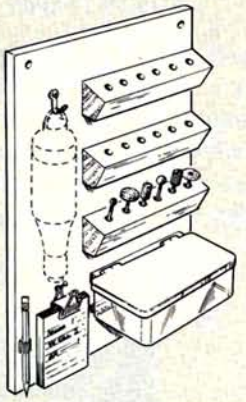
Please help me to continue the safe enjoyment of my pastime by not allowing the FCC to carry out its proposals for the 72 to 76MHz band.

(Continued on page 23)

HINTS & KINKS

JIM NEWMAN

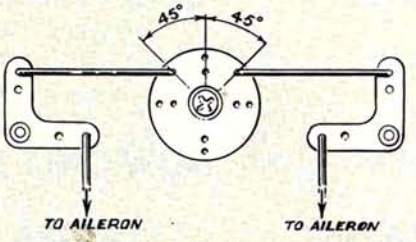
Model Airplane News will give a free one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Hints & Kinks." Send a rough sketch to Jim Newman c/o *Model Airplane News*, 251 Danbury Rd., Wilton, Ct 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO, AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can't acknowledge each one, nor can we return unused material.



DREMEL WALL RACK

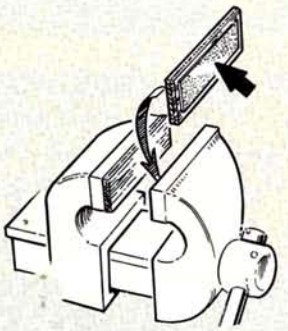
Use leftover scraps of wood to make this rack for your Dremel Moto-Tool and its attachments. The tool bits slope outward and can easily be picked out, while other accessories are stored in a plastic box that can be liberated from the kitchen! Note the pad and pencil.

John Wapensky, Summit Hill, PA



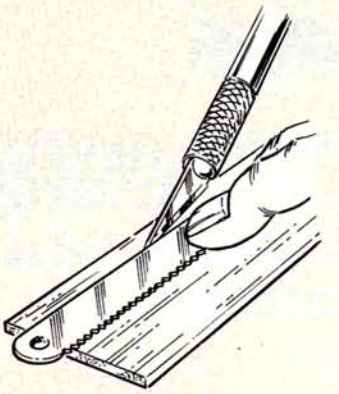
AILERON DIFFERENTIAL

To overcome adverse yaw caused by the drag of a downward-moving aileron, rig the ailerons so that the upward-moving aileron moves more than the downward-moving one. Drill holes in the servo wheel at 45 degrees to the centerline, then make sure the bellcranks are oriented as shown. In the arrangement shown, the aileron horns must be attached to the bottom of the ailerons. *Stan Zdon, Coon Rapids, MN*



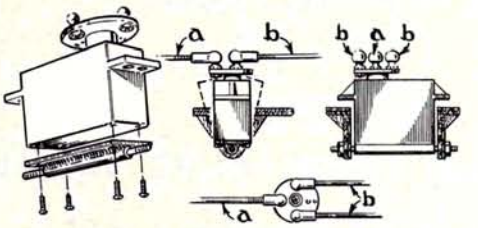
GENTLE VISE JAWS

To protect soft or delicate items from being scored or scratched by your vise, attach pieces of soft wood to the vise jaws. Clean the jaws with acetone before you attach the wood. Use double-stick tape to attach it, and you'll be able to peel it off easily. *Ward Kelley, Manistee, MI*



NON-SLIP STRAIGHTEDGE

When you cut smaller items, use a hacksaw blade as a good non-slip straightedge. The sides of the teeth will dig into the wood slightly and prevent the blade from sliding backward. Don't use this method for heavy cutting, because the knife might suddenly jump the thin blade and cut your fingers. *Tony Price, Warnbro, W.*



ROCK-A-BYE MIXER

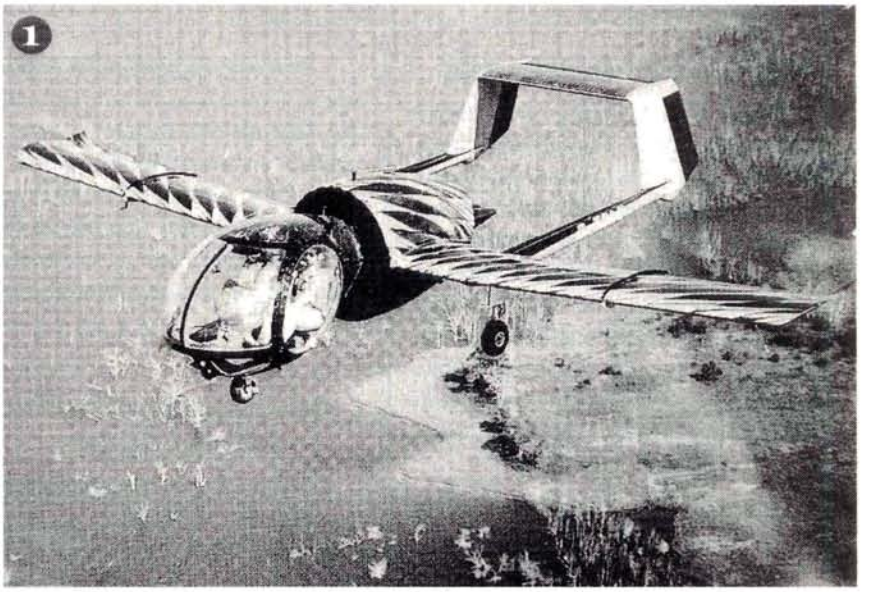
Using fine fiberglass tape and CA, attach a piece of inner Nyrod to a 1/16-inch (1.5mm) plywood plate, then use longer servo-case screws to attach the plate to the bottom of a servo. Attach the servo between two plates, as shown, so that it's free to pivot back and forth. In the diagrams, for a vee-tail, rod (a) is the elevator pushrod, while the two (b) rods are the rudder pushrods, or (a) is the elevator pushrod, and the two (b) pushrods are for the elevon in a flying wing. Ball joints must be used on all pushrods. *Ulf Jonsson, Lulec, Sweden*

PAINT MIXING

To mix paint easily and cleanly, just drop a ball bearing into the paint jar and shake it vigorously. The ball bearing will stir up the settled pigment and thoroughly mix the paint. *Steve Fisher, Seattle, WA*

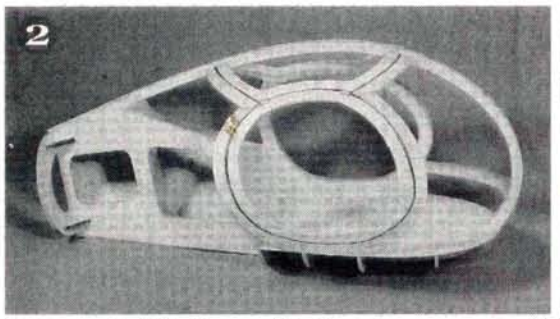
HOW TO Building with Laminated Balsa

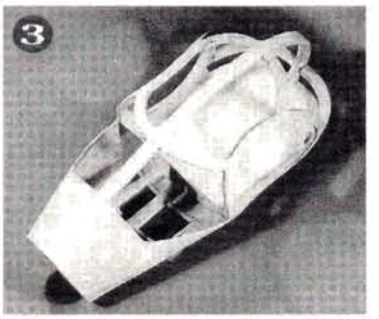
by FAYE STILLEY



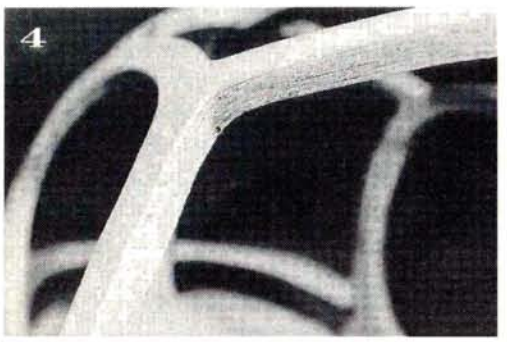
1. The full-scale Optica.

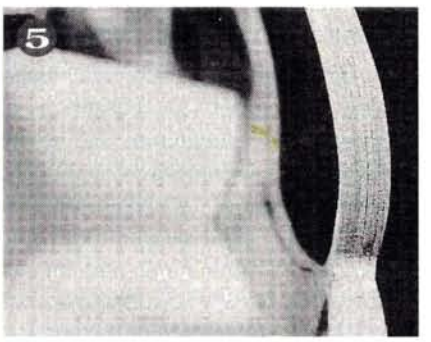
EASY COMPOUND CURVES





2. As you attach the framework to the spine, you may need to twist or bend the frame slightly to achieve the desired shape. Note the 1/16-inch pushrod wire that supports the fuselage framework.
3. The forward fuselage—trimmed and sanded to shape.





4. A close-up of the laminations—seven 1/16-inch layers and the original 1/32-inch layer that was glued to the pushrod wire. 5. To widen the fuselage so that the windshield fit properly, two additional layers of 1/16-inch balsa were laminated to the framework's exterior. This photo illustrates the flexibility of the lamination technique.

SCRATCH-BUILDING sometimes presents challenging situations. When I decided to build a scale model of the Optica Scout (see Photo 1) with its bubble cockpit and its host of compound curves, I faced several challenges. You might say that the cockpit *is* the fuselage. The cockpit's teardrop shape resembles the nose of a helicopter. The challenge was how to build a lightweight structure out of wood that was strong enough to support the nose wheel and withstand the impact of landings.

An aircraft-plywood spine gave the fuselage the basic shape and strength; now I had to figure out how to build the complex shape. Carving out blocks of balsa was one possibility, but just the thought of all that cutting, carving and sanding, and the effort required to match the compound curves on the left and right sides made my stomach uncomfortable. After a few days of doodling and "noodling," I came up with an idea that really worked well.

By laminating thin pieces of wood, one layer at a time, I could build a structure with compound curves on the inside as well as on the outside. The inside of this fuse/cockpit would be as visible as the outside.

To create the basic fuselage shape with all its compound curves, I first built a fuselage spine out of plywood. To create the skeletal frameworks for the left and right fuselage hemispheres, I carefully bent 1/16-inch pushrod wire. To avoid disturbing the shape formed by the wire, I glued 1/32-inch balsa

along the wires to the inside face of the wire form (see Photo 2). Thick CA worked well because it allowed the wood to stick with only a minimum amount of pressure on the wire.

With the 1/32-inch balsa in place, the skeletal frameworks were refitted to the spine, and minor adjustments were made by bending the wire and the thin balsa at the same time. Using thin CA, I then carefully laminated 1/16-inch balsa to the inside face of the previously glued 1/32-inch balsa.

At this point, the structure had gained a surprising amount of strength, but it could still be twisted and shaped. I added another lamination of 1/16-inch balsa to the previously glued 1/32-inch balsa, but this time on the side glued to the wire. This lamination was glued to either side of the wire, i.e., on the outside face of the framework. I did this to provide a flat, level surface for the next outside surface lamination.

Once the wire/balsa frameworks were glued to the spine (see Photo 2), I made laminations of 1/16-inch balsa on the inside and outside of the fuselage framework, until the desired thickness was reached. Then I trimmed away the excess and shaped the wooden framework (see Photos 3 and 4).

EASY CORRECTIONS

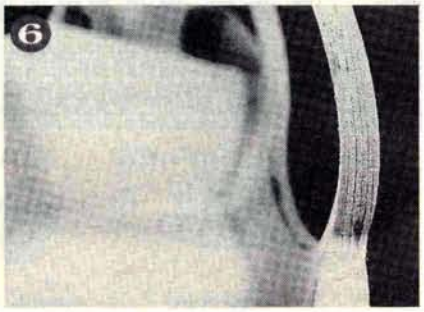
When I tried to fit the plastic windshield bubble to the frame, I found that I had miscalculated the amount of bulge that the frame needed. It was an 1/8 inch too shallow at the front of the door area, so the plastic didn't fit flat onto the frame. I added two more 1/16-inch laminations to the outside of the frame and sanded it to shape (see Photo 5).

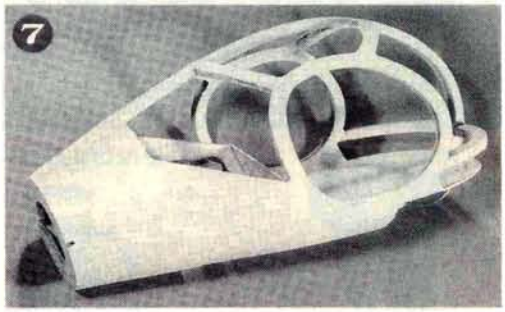
After I installed the plastic bubble, I sanded away two laminations on the inside of the frame. The frame had taken on the new shape, and now it had a uniform thickness. The bulge from the extra laminations was no longer detectable (see Photo 6).

SHEETING COMPOUND CURVES

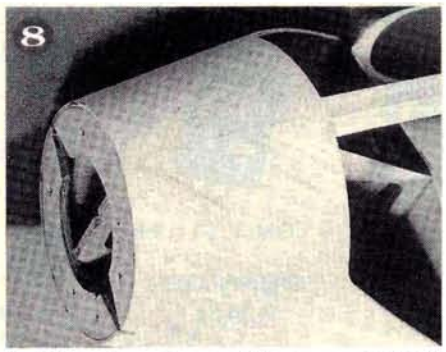
The rear of the fuselage, which has a helical contour was round with a reduced radius. The shape changed to oval and got bigger as it moved toward the front of the cockpit. The resultant compound curves posed another challenge: the fuselage could not be sheeted with a single sheet of 1/8-inch balsa, and I didn't want to plank it because it would take a lot of time and add weight. Planking is also difficult to finish with film covering because

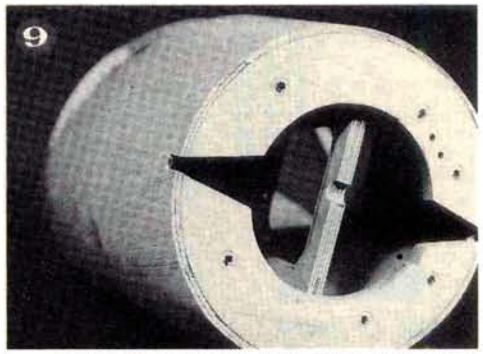
(Continued on page 88)



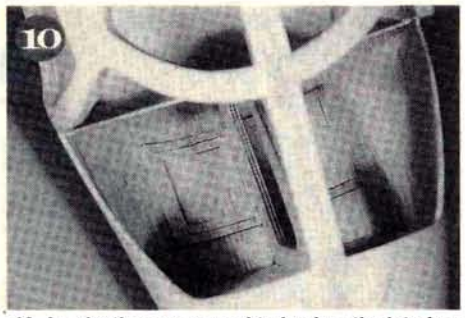


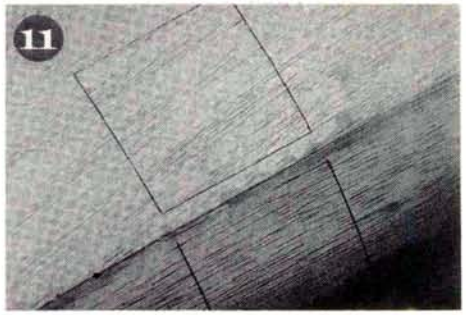
6. Here, the inside of the same frame shown in the previous picture has been sanded so that the framework has a uniform thickness. 7. By rolling the grain of 1/16-inch balsa around the fuselage's curve, the author was able to sheet the forward fuselage up to the fuselage chin.



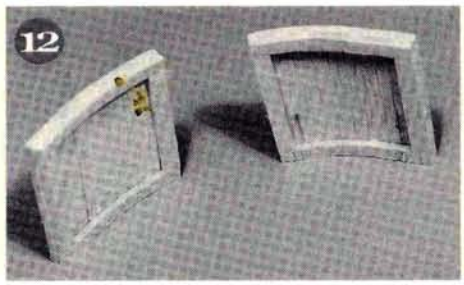


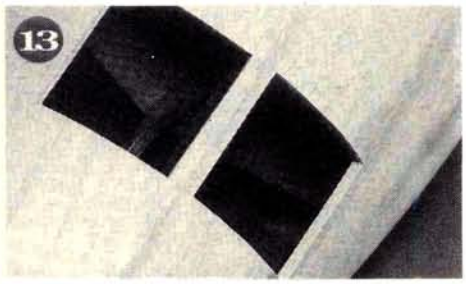
8. Rolling the grain around the curves also facilitates covering the tapered contours of the aft fuselage. Two layers were used to achieve the desired strength and thickness. 9. Detail of the fuselage skin laminations that ring the firewall.





10. Laminations were used to beef-up the interior side of the hatches before they were cut out. 11. After driving straight pins through the inside fuselage wall at the four corners of the planned hatches, outlines of the hatch walls were drawn on the exterior fuselage.





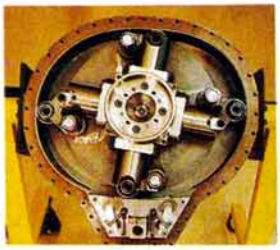
12. The hatches after they had been cut out. The laminating technique ensures that they maintain their shape. 13. The hatch doors with hatches removed.

AIR SCOOP

CHRIS CHIANELLI

New products or people behind the scenes—my sources have been put on alert to get the scoop! In this column, you'll find new things that will, at times, cause consternation, and telepathic insults will probably be launched in my general direction! But who cares?—it's you, the reader, who matters most! I spy for those who fly!

Rotorcam Engine



Prototypes of the Rotorcam engine are now being developed by the Murray Development Corp. for use in model airplanes. The engine's variable compression feature means any fuel can be used. The first R/C engine is expected to be released next year.

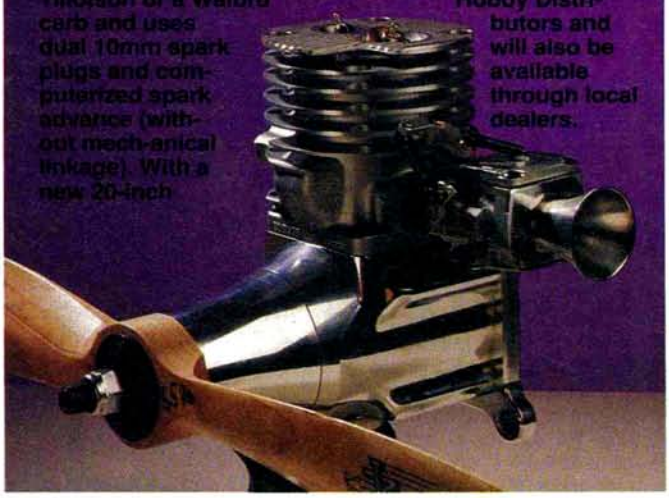
The piston and cylinder assemblies rotate like the spokes on a wheel around the drive shaft. Rollers at the bottom of each con rod follow an oval cam track on the inside of the engine's housing. Each cylinder has an opening that permits intake or exhaust as it is rotated past the corresponding stationary port. Because the engine uses piston technology, it avoids the apex wiper seal problem associated with Wankels.

Jerome L. Murray, who holds over 50 patents, invented the Rotorcam—a 4-stroke rotary engine. He once took a test flight in the "Spirit of St. Louis" with Charles Lindbergh to check out the plane's compass.

For more information,contact Murray United Development Corp., 10 Orben Dr., Landing, NJ 07850; (201) 770-3201.

WEBRA 4.4

This Webra 4.4 is part of a new line of giant-scale engines that will include 2.6, 3.3, 3.8 and 5.6 sizes. More in keeping with standard model-engine design practices, the 4.4 has a single-bolt prop hub with lock and jam nuts and a single-tension compression ring. The glow version has a Tillotson carb, while the ignition version has a Tillotson or a Walbro carb and uses dual 10mm spark plugs and computerized spark advance (without mechanical linkage). With a new 20-inch adjustable pitch prop developed by the Webra 4.4 designer, Randy Villines, this 5.5-pound engine is said to have produced approximately 50 pounds of thrust. High-octane fuel is recommended—50:1 fuel/oil. The glow and ignition versions are priced under $1,000. This new line of engines will be distributed by Horizon Hobby Distributors and will also be available through local dealers.



TW Enterprises imports the Elec-Jet electric 05-powered ducted-fan system manufactured by British Morley Helicopters. The Elec-Jet is a 2.25-inch-diameter, 8-blade nylon fan that runs in a black plastic duct. This system—designed for inexpensive, 21-turn, 0.8mm wire motors—puts out 12 to 14 ounces of thrust at a wind velocity of 100mph on a 7-cell Ni-Cd pack. An optional adaptor is available to convert this unit for Cox TD 049 or TD 051 engines. Elec-Jet is $44, and the adaptor is $15 plus $5 S&H. Contact TW Enterprises, P.O. Box 2995, Garden Grove, CA 92642-2995.

05 DUCTED FAN

Calling all Followers of the Crystal

Radio-control frequency crystal, that is. I'm proud to broadcast a premier event—the 1993 New England R/C and Hobby Show to be held at the Aleppo Shriner's Auditorium in Wilmington, MA, on Friday, April 30 through Sunday, May 2. This big show boasts 200 booths that will feature all types of radio-controlled goodies. The Aleppo Order of Shriners is determined that this will be "a hassle-free show"! If you need help with transportation, accommodations or booth set-up, call (617) 665-6466 or (508) 657-4202; fax (508) 657-8950; or write to Shriners Auditorium, P.O. Box 1008, Wilmington, MA 01887-0578.

AIR SCOOP

LET THE SHOW BEGIN

Some of this month's "Air Scoop" is dedicated to the '93 IMS show, which was held in Pasadena, CA. Exemplifying this spirited show is this "airplane-hat" wearer, Bob Reynolds, of K&BR Model Products. Bob—who wore this hat throughout the show—is the maker of the "Bobber" series of gliders, and he and his wife, Kim, generously sponsor the Slope-Tech BBS on-line bulletin-board service you can access on your PC. Call that service at (310) 866-0934.

SIG FAZER

When larger companies like Sig Mfg. respond to a "fad," I guess it's safe to say that it's a fad no more. Sig's new fun-fly model, held here by Air Age Publishing's advertising manager, Sharon Warner, is Sig's entry into the world of fun fliers. The Fazer has a 48-inch wingspan, 680 square inches of area and a ready-to-fly weight of 3.5 pounds. The all-balsa Fazer is for .25 to .40 engines, and it has a profile fuselage that might put its weight too high for serious competition, but it certainly makes it a lot more attractive than those "flying-arrow-shaft" types. It's available at your local hobby shop.

SUPER-SERVO?

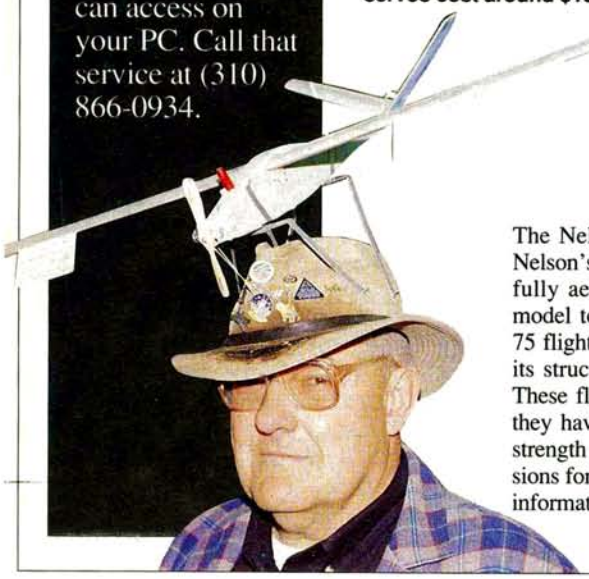
This High-Tech 605 could be the next generation in servo technology. It is a standard-size servo with super torque. At 4.8 volts, it generates 77 ounce-inches of torque at a speed of .15 second; at 6 volts, it generates 91 ounce-inches at a speed of .12 second. The secret is its use of helical gears made out of engineering plastic instead of metal. The finely engineered helical-cut gear gives 25 percent more efficient power transfer with absolutely no backlash. The servo comes with a special PC board that has a ceramic substrate with four power transistors to absorb the super torque loads. Sold only at hobby stores, it costs $59.95. (Comparable servos cost around $100.)

Stinger .10

Lanier R/C owner Bubba Spivey is a proud—and obviously happy—father of a new baby Stinger. Approximately 40 percent of the original Stinger's size, the 32-ounce Stinger .10 has a fully symmetrical, 36-inch wing and a wing loading of 18 ounces per square foot. Having the same simple construction as its older brothers, the Stinger .10 is fast and easy to build. The appearance of the square fuselage is greatly improved with ABS plastic parts that give it that distinctive Stinger look. To keep things light, the tail assembly is built-up. It was designed expressly for a .10 engine, but with an ASP .12 or an O.S. .15, the Stinger .10 becomes a killer bee. For more information, contact Lanier R/C P.O. Box 458, Oakwood, GA 30566; (404) 532-6401; fax (404) 532-2163.

AL-1 by Nelson

The Nelson AL-1, which will be the first in Nelson's line of all-metal R/C kits, is the first fully aerobatic, "giant-scale," all-metal R/C model to be flown. Having logged more than 75 flights at several R/C events in Nevada and California, the AL-1 has proven the worth of its structure, which uses the specially developed Nelson 1/16-inch Subminiature Poprivets. These flat-head rivets have a head diameter of .100 inch, they protrude only .007 inch, and they have a shear strength of about 50psi. (A regular, aluminum, 1/16-inch rivet has a shear strength of 75psi!) The model features a fully detailed cockpit, a hinged canopy and provisions for a 1/3-scale pilot. The engine is fully cowled and includes an exhaust system. For more information, contact Ted Nelson Co., P.O. Box 20637, Reno, NV 89510; (702) 323-4955.



AIR SCOOP

2 Meters of Feather-Cut Quality

Old-world craftsmanship shows in the Shadow 2-meter from Tekoa (manufacturer of the Feathercut foam cutter). They say this 40-ounce plane is sophisticated and competitive and has docile handling characteristics that are not unlike those of a polyhedral ship. It obviously handles well in thermal country—Blayne Chastain won the Nats with it last summer. The Shadow 2-meter features a prefab Obechi-covered stab and rudder, and carbon-fiber-reinforced, Obechi-covered, white foam wings with hollow fiberglass tips (SD 7037 airfoil; 10-ounces-per-square-foot wing loading). The fiberglass fuselage has Kevlar running from nose to tail. The kit includes a Teloa-style, stamped, anodized-aluminum hardware package. This plane will retail for $275 and will be distributed by NorthEast Sailplanes (802) 658-9482.

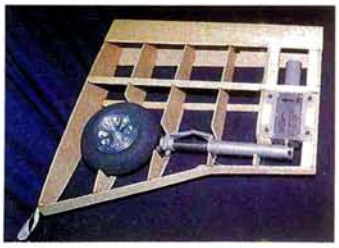
PANTHER POWER

Marilyn Gruenebaum from Model Aviation Technology holds the new 3.4ci Panther ignition engine. Other sizes in this new line include a 2.6ci and 4.4ci. The 2.6ci costs $975, weighs 3.75 pounds and is rated at 26 pounds of thrust with a two-blade 20x8 prop turning at 8,000rpm. The 3.4ci costs $1,200, weighs 4.4 pounds and is rated at 30 pounds of thrust with a two-blade 22x12 turning 6,800rpm. All engines are custom-built and numbered, and they have an advanced solid-state coupled CD system, chrome liners, double ball bearings and a magnesium crankcase. No maintenance is required, and it has a lifetime guarantee. Stats are available on request. For more information contact: MAT, 12848 Touchstone Place, Palm Beach Gardens, FL 33418; (407) 626-6955; Fax (407) 626-1588.

QUIETLY SMOKE YOUR 4-STROKE

This is Slimline's new, in-cowl, 4-cycle smoke-muffler that produces four less decibels than the typical stock 4-stroke mufflers. They're suitable for compact, side-mounted applications, such as those found on the Goldberg Ultimate and the Extra 300, and they can be used with the O.S. Surpass .90 and 1.20 and the YS 1.20 in the regular or smoker version. For more information or a catalogue, write: Slimline Mfg., P.O. Box 3295, Scottsdale, AZ 85257; (602) 967-5053; Fax (602) 967-5053. (Include $1 for the catalogue.)

Ultra-Control



Ultra Precision's new P-51 retracts for a Reno-size, 100-inch-wingspan model feature 50-pound rating, 1-inch-diameter air cylinders, between-rib installation (no rib-cutting necessary), all-metal construction, axial-cam mechanism, and a new pneumatic system that features side-exhaust control of retraction and extension speeds. Other systems regulate up and down speeds by restricting the incoming gases to the piston. Ultra Precision's new system restricts only the outgoing (exhaust) side of the piston, thereby maintaining full pressure on the intake side for more positive gear actuation and locking. Contact Ultra Precision Technical Services Ltd., 1244 Honeysuckle Cres., Oakville, Ontario, Canada L6H 2S8; (416) 842-1703.

Future Flight

The Thermal Thing is a $19.95 glider in a bag. Few people would argue that this is definitely a bargain item. With Kyosho's inexpensive AP29 electric motor and an inexpensive battery pack, you have a plane—minus radio—for less than $60. Thermal Thing has die-cut parts, and its all-up weight, with standard receiver, battery pack and microservos, is 18 ounces. Conversions to glow and electric are shown on the plans. It's available directly from Future Flight, 1256 Prescott Ave., Sunnyvale, CA 94089; (408) 735-8260 (telephone and fax).

COSMIC WIND

In the late '40s, Tony Levier, the chief test pilot for Lockheed (he tested the P-38), designed the full-scale Cosmic Wind and flew it in the Goodyear races held at that time. Tom Gruenebaum of Model Aviation Technology found out that Tony lives near the IMS show. Tony visited the show and was moved to see the first ½-scale model sold in this country at the show. Model Aviation Technology is importing this fiberglass, 70-inch span Cosmic Wind, which uses engines that range from a 1.08 2-stroke to a 2.70 4-stroke. This complete kit includes wheels and an aluminum spinner. Contact: Model Aviation Technology, 12848 Touchstone Place, Palm Beach Gardens, FL 33418. (407) 626-6955; Fax (407) 626-1588.

PILOT PROJECTS

A LOOK AT WHAT OUR READERS ARE DOING

SEND IN YOUR SNAPSHOTS

Model Airplane News is your magazine and, as always, we encourage reader participation. In "Pilot Projects", we feature pictures from you—our readers. Both color slides and color prints are acceptable.

All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of 1993. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in!

Send those pictures to: Pilot Projects, Model Airplane News, 251 Danbury Rd., Wilton, CT 06897.

TOP GUN A4E

Dave Hock of San Francisco, CA, built this striking model from a Byron Skyhawk kit to which he added nice touches, such as antennas, an arresting hook, air scoops, a fuel probe and panel lines. Its finish is Poly-S paint with Black Baron clear-coat, and the model sports the Top Gun Aggressor Squadron markings (dry transfer markings from Aeroloft Designs). The model weighs 11 pounds, it's powered by an O.S. 77 VF DR engine turning a Byro-jet fan unit, and it's controlled by a Futaba radio. This is Dave's first ducted-fan model but, he says, it won't be his last!

12TH ANNIVERSARY GRASSHOPPER

After a 12-year pause from modeling, Art Grabow of Everett, WA, celebrated his return to the hobby by building this Goldberg Anniversary Edition Piper J-3 kit in military dress. Powered by a Pro-Magnum .45 engine, the model is covered with cloth and painted with Pactra Poly-U polyurethane paint. The finish is weathered for a "well-used" look, and the landing gear has functional shock absorbers. We always love seeing "Cub" scouts!

FANTASTIC FLYING FORTRESS

Edward Kubasti of Dallas, PA, scratch-built this B-17G from Bob Holman plans and finished the model with polyester and acrylic enamel paint. Powered by four Royal .45 engines, the big bomber has a 72-inch wingspan and weighs 38 pounds. The all-silver B-17G is complete with formed, clear-plastic turrets, a nose dome and windows, and it also has operating split flaps. We bet this baby is a handful to get to the flying field!

PILOT PROJECTS

1ST PLACE— WW II HORTEN 229 V3

Shown in the December '92 issue, Ken Jack's striking scratch-built WW II German Horten 229 V3 flying wing is truly a work of art. The 22-pound model has a 108-inch wingspan, it's 49 inches long, and it's powered by two O.S. .91 ducted-fan engines driving Ramtee fan units. The Horten has scale, retractable landing gear and an operating drag chute. Daughter Zofia looks proud of her father as she holds the plane for the photograph.

WINNERS

This continues to be our most popular column, and throughout the year, we delight in reviewing your entries. The degree of imagination and building skill we see is amazing and, as always, to pick the winner was very hard, indeed.

- **$500 goes to Ken Jack of McGraths, Australia**
- **A one-year subscription to *Model Airplane News* and a set of Air Age Publishing model aviation books go to George Coward (Fremont, CA) and Jon Christenson (Minneapolis, MN).**

Congratulations!

2ND PLACE— RUTAN TRANSPORT

George Coward slipped into second place with his scratch-built 1/12-scale, Rutan AT^3 Transport. This twin .25-powered model has a 55-inch wingspan and weighs in at 6.6 pounds. The model has a box tail, twin tail booms and is equipped with a canard that helps to support the engine nacelles. A scale model of Burt Rutan's proposed military Advanced Tactical Transport, the model was shown in the November '92 issue, and it's one of the most unusual projects we've seen.

3RD PLACE— ROTO-ROOTER

Built entirely of wooden yardsticks (including rotors) and using the tail surfaces from a scrapped Duraplane, Jon Christenson's twin-rotor Autogyro is in third place. Shown in the October '92 issue, the Roto-Rooter cost nothing to build, and it's a true recycler's dream. It's powered by a Saito FA-40 4-stroke engine and is 36 inches long (of course!). Jon says it flies incredibly slowly and is virtually crash-proof (it's able to descend vertically to a soft spot-landing). The project is a wonderful example of an innovative modeler using the resources available.

Sport Flyers News

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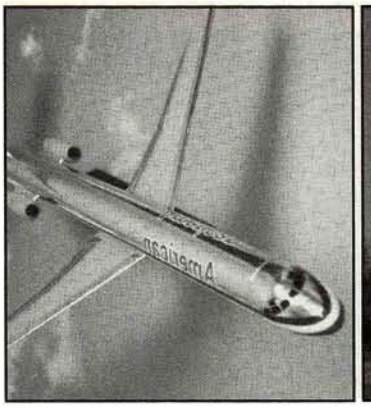
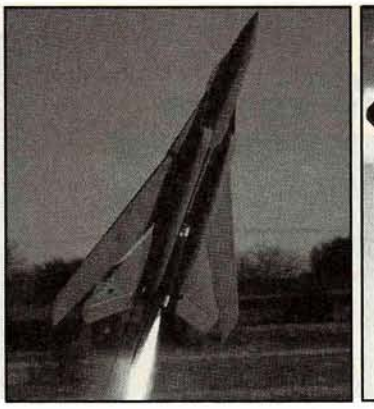
HobbyLab Launches "R/CS" Series Rocket Gliders F-14, SR-71 & MD-80





Offers Dealers/Mfgrs. New Entry Level Products, Consumer Marketing Program

The F-14, SR-71, and MD-80 are the first in a series of low cost rocket powered R/C and free flight gliders designed by HobbyLab for the entry level modeler. Known as the "R/CG" Series (for R/C Glider), each R/CG kit utilizes components offered by hobby industry manufacturers. A key feature of the R/CG Series is the inclusion of everything needed by the consumer to fly "in-the-box", including rocket motors, launcher, launch controller, and in some kits, radios. These components are combined with new materials and design concepts developed by HobbyLab. Hobby dealers marketing programs slated for the R/CG Series includes a TOLL FREE Dealer Referral line, and co-op ad funding. Production for the R/CG kits is being coordinated through ten industry manufacturers. Initial deliveries are scheduled for March, 1993.

Specifications:	F-14	SR-71	MD-80
Length	35"'	33"	28"
Wingspan	54.5"	24"	22.5"
T.O. Weight	24 oz.	12.5 oz.	9 oz.
Engine Size	F	E/F	C/D
Build-to-fly time	4 hrs.	2 hrs.	2 hrs.
Altitude from boost	500-700'	500-700'	500'+

FCC ALERT!

The FCC Private Land Mobile Radio Service has proposed (Notice of Proposed Rule Making) NPRM-PM Docket 92-235, which, if implemented, would allow the Private Land Mobile Radio Service to insert two new frequencies between those currently assigned for modeling use. These new frequencies could create not only safety problems for fliers, but also an economic impact on fliers and radio manufacturers. Sport Flyers urges you to notify the FCC of the dangers to the modeling community! This must be done before February 26, 1993 — the deadline for comments.

Want a copy of the SFA Special Report Newsletter and an interview with Robert McNamara of the FCC? Call 800-745-3597.

1.) Write a personal letter to the FCC:

FCC
1919 M Street, NW
Washington, D.C. 20554

2.) In a hurry? Use Sport Flyers FCC Lettergram with Western Union. It's a pre-set lettergram which will be immediately sent on your behalf to the Office of the Secretary of the FCC. The complete cost for using the Hotline is $5.75 which can be charged to your home phone or your Mastercard/VISA. **CALL 1-800-641-1818 Hotline #9340.**

U-Needle™ Engine Safety Device Free To All 1993 Sport Flyers Members

The U-Needle™ Engine Safety Device is being given free to all 1993 Sport Flyers members (delivery is expected in late March). Development of the U-Needle™ was initiated after a study of SFA's claims history (90% of all claims in 1992 were from injuries sustained while adjusting needle valves). Original drawings for the U-Needle™ design were completed by HobbyLab's Phil Oestreicher, with production development and prototyping being led by Al Clare. U-Needle™ features include:

- Single-handed operation, to permit adjustment of needle valve using one hand;
- Recessed SureLok™ needle valve gripper is finger button actuated, grips needle valve for accurate adjustment;
- Light weight, injection molded plastic design flexes on impact instead of breaking or fragmenting;
- Ergonomic design incorporates 25% angle bend in handle for firm grasp, added safety;
- Handle doubles as propping device, keeping fingers out of props. Incorporates hole fittings for adjusting wire type needle valves.

AIRWAVES

(Continued from page 8)

THREE WILDCATS

I am interested in a WW II fighter plane—the FM-2 Wildcat. I understand that a construction article in *Model Airplane News* was published.

I am 70 years old and I'd like to find plans or a kit. I've sought this for years and have yet to find anything of the FM-2 Wildcat!

FRANK F. BOYSIEWICK
Hacienda Heights, CA

Yes, indeed, Frank, we have some FM-2 Wildcat plans—three, to be exact. One, I am sure will suit your modeling likes and skills. The smallest is FSP 09791 (September '79). Though not an FM designation, this F4F-3 variant is a compact R/C model using stick-and-tissue construction. Designed by J.P. Neate, it has a 38½-inch wingspan, uses a .15 engine, and the plan costs $9. The next option is plan FSP 01782 (January '78). Designed by Eric Fearnley, this model has a scale, planked fuselage with built-up, sheeted wings. It has a 62-inch wingspan, uses a .60 engine and the plan costs $12. The last and largest is plan FSP 02832 (February '83). Designed by Bob Karlsson, this model uses .60 to 1.20 engines, it has a wingspan of 76 inches, and it was designed to use a super-scale retractable landing-gear system (also designed by Bob Karlsson). The plane plans cost $28, and the landing-gear plan—FSP 03832 (March '83)—costs $11. Copies of all the relevant construction articles are also available for $4 each from our mail-order department. (Check the "Buyers' Mart" for the last two plans mentioned.) GY

TINY TAIG

On page 53 of the December '92 issue of *Model Airplane News*, you show a Micro Lathe. Where can I buy one?

STEVE BANKS
Sacramento, CA

Steve, the Taig Micro Lathe is available from Hobby Lobby Int'l, 5614 Franklin Pike Cir., Brentwood, TN 37027, for $284. I can testify to the quality and durability of this very accurate tool. I bought mine about 18 years ago, and except for keeping it well-oiled, I've done nothing extraordinary to extend its life. It can machine aluminum, brass, cold-rolled steel and, of course, wood!

The more you use a lathe, the more you wonder how you ever got along without one. I even use mine to run-in new model engines by placing the prop shaft in the chuck and turning the shaft at about 500rpm. I use lots of WD-40 and remove the glow plug. With about 20 minutes of on-and-off treatment, the break-in time of the engine is probably reduced by half. GY

SHOP PLANS

I need help! I'm putting together a model workshop for the second time in as many years. The other one I built wasn't right. Where can I get some really good shop plans? Your many subscribers must have something they can pass on. I thought I'd ask after getting my December issue and seeing the Plans Directory on the cover. If there are so many plans for planes, etc., surely, there must be some shop plans somewhere. Perhaps *Model Airplane News* has published some in the past. Your help would be greatly appreciated.

SAL TAORMINA
Lake Ronkonkoma, NY

Sal, the first place to check is a home-improvement center. Many of these places have a shop and power-tool department, and this is where you'll find plans for contractors and home builders. At my local home-improvement center, a computer allows you to design your own home, patio, deck, kitchen or, in your case, workshop (with the help of a salesperson, if you need it). Everything

(Continued on page 115)

CENTER ON LIFT

MICHAEL LACHOWSKI

CROSSWIND LAUNCHES, ANTENNA INSTALLATION

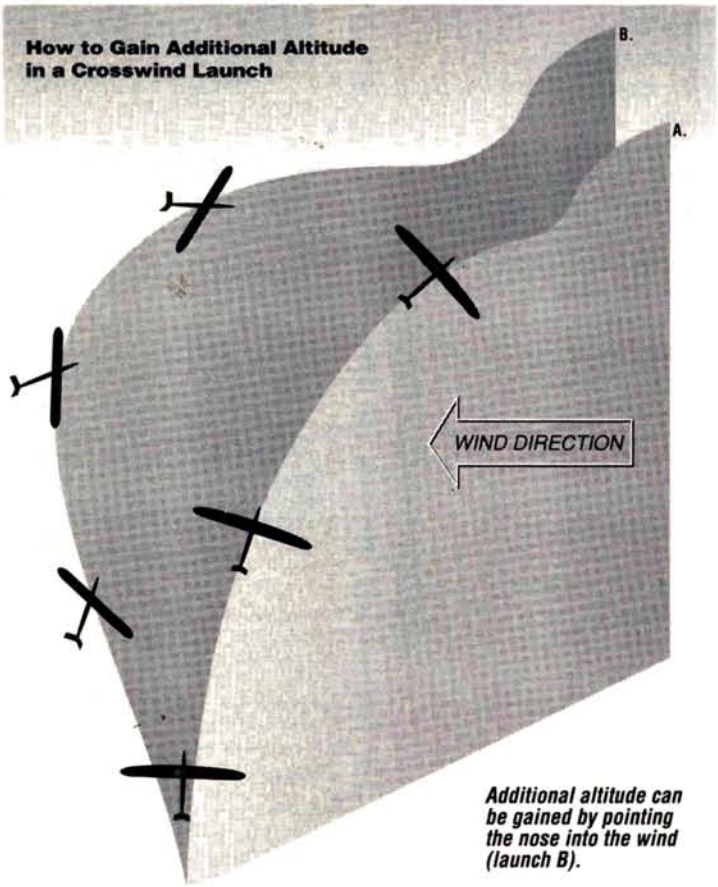
THIS MONTH, we'll talk more about launching techniques and what to do on crosswind launches. For everyone out there finishing winter building projects, there are tips on antenna installation and changes to the Easy Eagle sailplane. Finally, I'll tell you about some good newsletters.

CROSSWIND LAUNCHING TECHNIQUES

Despite our best efforts to set up winches into the wind, weather has its ways of changing things and making crosswind launches unavoidable. Let's look at what you can do to deal with this situation and increase launch height.

When the wind direction shifts a little, most fliers continue to launch straight up the line toward the turnaround. You can see the sailplane fighting the wind direction, and launches aren't as good as launches straight into the wind. Zooms at the end don't gain as much altitude. The solution to this problem is to fly into the wind.

In the initial part of the launch, drift over to the downwind side so that the model will be launched more directly into the wind. Getting used to flying the model from the side of it instead of from directly behind it takes some practice. Use the rudder to control the model's direction on the launch, and get it pointed upwind as soon as it drifts off to the side. To prevent popping off, start to feed in some rudder as soon as the drifting starts. Now fly upwind as you would for a normal launch.



Additional altitude can be gained by pointing the nose into the wind (launch B).

Easy Eagle Supplement

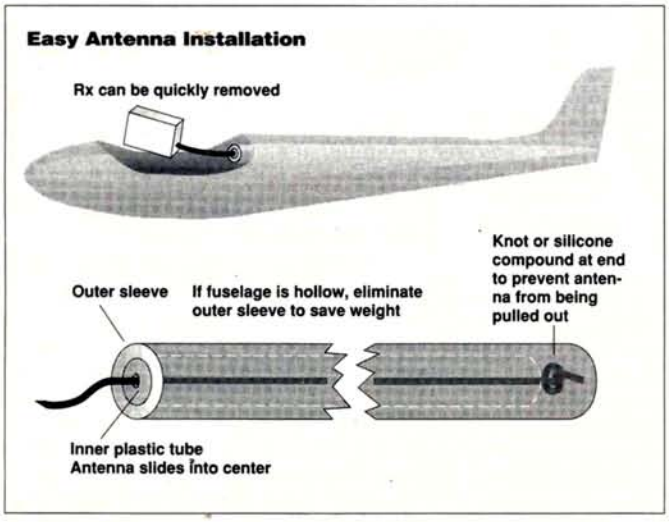
Easy Eagle designer Harley Michaelis sent me a note that lists some changes to and tips about the Easy Eagle kit, which Dave Garwood reviewed in *Model Airplane News* (January '93). Harley's prototype (with hand-picked balsa and balsa fuselage) weighed 25 ounces, while his kit ship comes in at 32 ounces. The kit flies a little faster, but the handling is the same.

- Wing structure. Use epoxy to glue the ¼-inch shear webs. Coat the end grain so the glue can soak in, and install the webs flush with the rear of the spar. The 1/16-inch facing webs must contact all three surfaces. Don't omit the 1/16-inch plywood facing webs, and use epoxy. For aggressive tows, make spars by sandwiching .014 carbon fiber between 1/16 x 3/16-inch hard balsa that you've glued with epoxy. Be sure to sand the surface of the carbon fiber to eliminate any gloss. Replace the ⅛-inch plywood dihedral braces with two 1/16-inch plywood braces with carbon fiber epoxied between the braces.

  Before you glue them, notch the beveled hingeline strips with a ½-inch strip of no. 50 sandpaper glued to a small block. This makes clean, uniform slots. Add a 1½-inch triangular gusset between the tip trailing edge pieces and rib 7 to strengthen the structure next to the flap. The flap actuator can be left floating freely. Remove the nylon tubes and don't glue it.
- Fuselage. You can use a ¼x20 tap instead of the blind nut for the wing-bolt block. Drill a 3/16-inch hole, and tap it. Treat the threads with CA and retap. The hatch can be attached and detached by bowing it. Shape the fairing to fit snugly under and around the wing's leading edge. In the front, make a notch that's the width of the screw and 3/16 inch deep. Butt the hatch to the wing, and drill a hole in the front for the screw. You can use the moving part of the switch to key the hatch at the rear.
- Trimming. Round the edges of the stab and elevator. Don't create a lifting airfoil. The recommended throws should be more than enough. Round the tip leading edge to improve stall characteristics. A sharp leading edge may cause tip-stall problems. Balance the plane at the wing bolt. If the ship dives, make sure the wing washout doesn't exceed ¼ inch. If it still dives, install a shim under the front of the wing. If the ship turns better in one direction, ensure that the washout is even, and that there aren't any warps in the wing or rudder.

Severe wind shifts cause more of a problem. Retrievers and turnarounds limit the amount you can fly off to the side, so 90-degree crosswinds will still suffer. Drift to the side on the launch, just as in a slight crosswind. When you get ready to zoom at the end, turn the model more directly into the wind. Keep turning the model during the zoom to point it more directly into the wind.

One point to note before your launch is the cause of the crosswind. Has the wind been moving steadily in that direction during the day, or is the wind shift a result of a thermal? If the wind has just changed, the most likely cause is a thermal. If this is the case, turn your ship back downwind as quickly as possible so you can catch the thermal. Practice steering your model on the launch. To learn what your model is capable of doing, try weaving from side to side as you launch. Be prepared for some surprises if you slow things down while turning from side to side. You will pop off a few times while learning. You must do more than just guide your sailplane; you must control it.



EASY-TO-REMOVE ANTENNA

Putting an antenna tube in the fuselage is a fairly common practice. Who wants an antenna hanging out in the breeze creating drag? The biggest problem with this setup is sliding the antenna into the tube. The antenna always bends, and those last few inches can be a real problem. The solution is to use a Nyrod. Mount the outer sleeve in the fuselage, just as you would a regular antenna tube. Now slide the antenna into the inner tube. This is done outside the fuselage. It's very easy to slide the inner Nyrod, complete with antenna, into the fuselage. Receiver installation is now a task that takes seconds instead of minutes.

NEWSLETTER NEWS

I've found two newsletters of interest—one new, one not. The new newsletter is the WACO technical newsletter. It's published by WACO, the maker of such fine sailplanes as the Magic and hot electrics like the Waco 10-550. The November issue is 10 pages long and covers topics that include how landings and design are related, care of composite airfoils, fabrics; and foam-cutting techniques. Most of the newsletter consists of good technical information, and several diagrams illustrate the ideas and concepts. Topics are covered in detail. The newsletter is *not* full of advertising, or how good the WACO designs are. It provides some insight into how some WACO designs are built. Even if you don't buy one of Frank Weston's designs, there are plenty of good ideas to be borrowed. Only one page has a significant amount of editorializing about model advertising. It concluded with an advertisement for the ultimate sailplane:

"Whether you are a novice or an expert, our high-performance, easy-flying, multi-task sailplane will have you flying like a pro in seconds. The almost-ready-to-fly kit contains only self-aligning, easily sanded components that are state of the art right out of the box and will give you one fast, stable, indestructible sailplane that will make you the envy of your friends and the lustful object of attention from all members of the opposite sex. Our design will also increase your IQ 75 points, cause your children to score perfect 800s on the SATs, restore that receding hairline, wash away the gray, eliminate bad breath, body odor and the heartbreak of psoriasis, and cause you to look years younger. For $279, you can have it all."

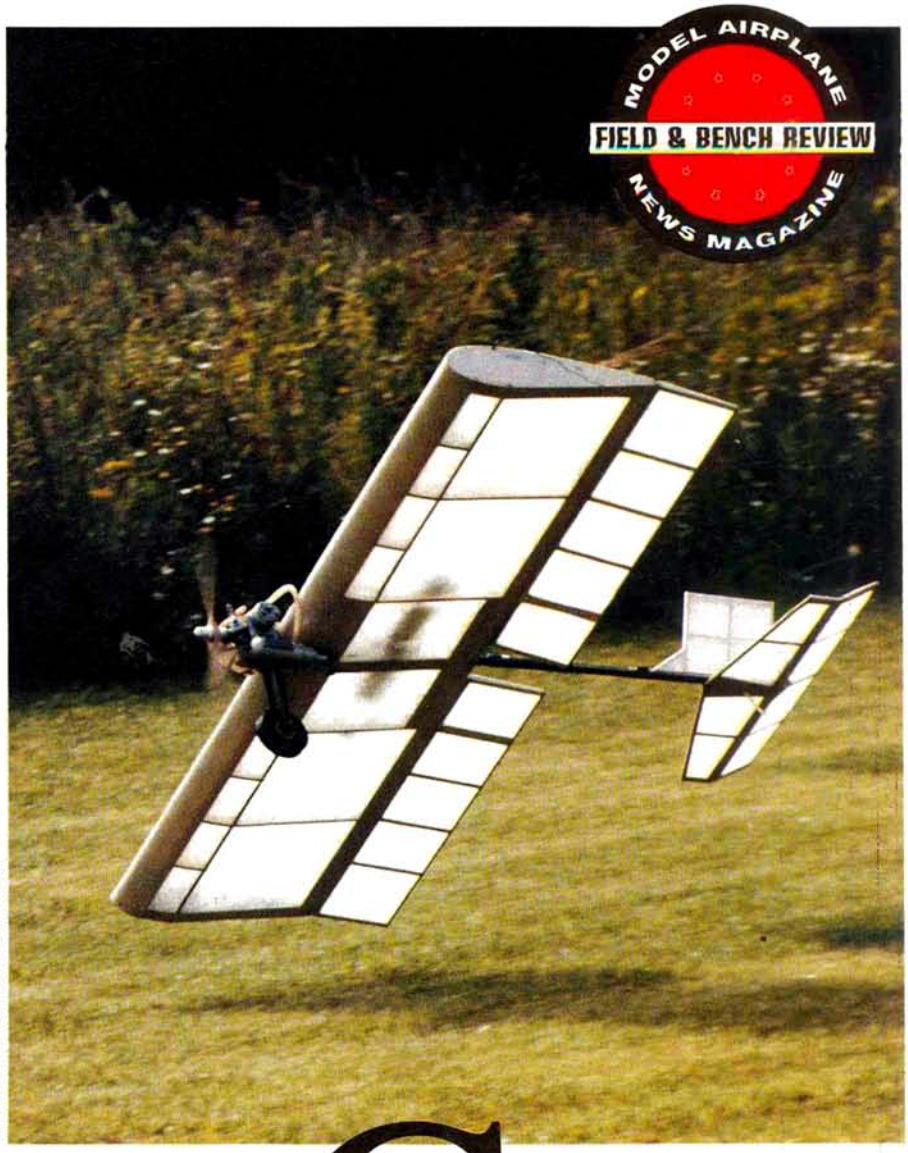
A subscription to this bimonthly technical newsletter costs $15. Write to WACO at 944 Placid Ct., Arnold, MD 21012, or call (410) 974-0968.

The other newsletter is F3B/USA. Byron Blakeslee, who has done a fine job as editor during the past few years, has passed control to a new editor, George Spitzer. George intends to continue the F3B orientation and will expand the journal to cover F3F slope racing which uses designs very similar to F3B models.

For those of you who aren't familiar with F3B, these models must perform well in three tasks—duration, distance, and speed. Duration is similar to typical thermal duration contests with a 7-minute max and spot landing. I mentioned speed in my last column (four laps on a 150-meter course). In distance, you try to get as many laps as possible in 4 minutes. All the tasks are flown man-on-man and normalized within the flight groups. F3B ships can perform well in standard thermal tasks and go fast, too. They also make good F3F slope racers.

George plans to give the periodical a new look and to expand its size. He's planning reviews of high-tech foreign and domestic sailplanes and articles about performance issues, structural testing, engineering, design criteria and activities in other countries. Even if you don't fly F3B, any thermal or slope pilot should find the topics covered worth the subscription price. If you are interested, the subscription is $12 for six issues. Send a check to F3B/USA, c/o George Spitzer, 87½ North Catalina, Pasadena, CA, 91106. ■

by LARRY OLIVER



PHOTOS BY PETER URBANOWSKI & LARRY OLIVER

FLORIO FLYER

COAL HAULER

This fun-fly machine is a real trophy hauler

THE FLORIO* Coal Hauler comes in a sturdy box that, when opened, reveals one plastic bag with assorted parts, most of which are for the landing gear. Also in the bag are some tie-wraps and small balsa, plywood and hardwood parts. A stack of uniform, machine-cut ribs are pinned together; there are also two ¼-inch-thick plywood engine-pod sections, two tail-boom sections and carbon-fiber reinforcement tape. There are balsa sticks banded together, wing sheeting and two long hardwood servo rails. The plans consist of two rolled sheets. A five-page instruction sheet is included. The sheet has a checklist for the construction sequence. On the first page, in bold print, it states, "This is not a beginner's aircraft. It was not designed to fly fast. You may experience flutter at high speeds. Use plenty of glue. Think light! Light! Light!" All of these points are valid and should be considered.

OPTIONAL RUDDER

Before starting construction, you must decide whether to use the optional rudder. It's an option because it will add from 1½ to 2 ounces, depending on the servo and the linkage used. (Remember: light! Light! Light!) The downside to having no rudder is that true flat spins and stall turns can't be performed, although a rather awkward-looking spin that loses altitude very quickly can still be done using elevator and ailerons. Take that into consideration, make your choice and let's get started with the construction.

CONSTRUCTION

The instruction sheet is very thorough, so I will concentrate on areas that I feel will help modelers who are not familiar with all the different areas of construction.

This airplane uses many standard construction methods with the addition of several clever techniques that make a light, rugged airframe.

First, laminate the two ¼-inch-thick plywood pieces of the engine pod together. When this has been done, finish cutting out the tail boom slot. Next, plot and cut out the engine-mounting slot, drill the engine-mounting holes and drill the landing-gear-leg mounting holes.

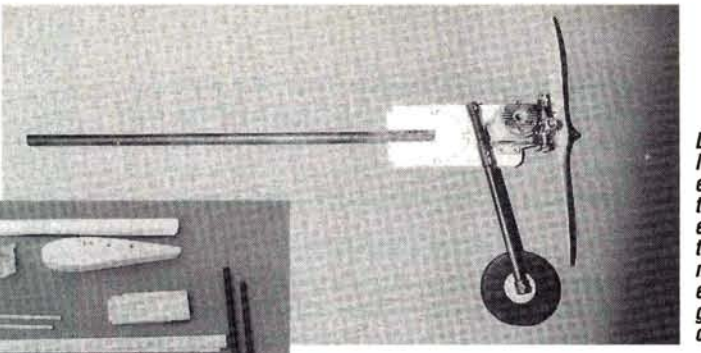
I've built several other fun-fly planes using this type of mono-wheel landing gear and have found the following sequence helpful. Read further into the instructions and find the gear-leg assembly instruc-

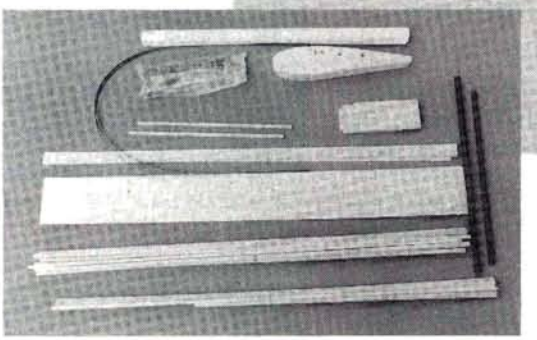
SPECIFICATIONS

Model name: Coal Hauler
Manufacturer: Florio Flyer Corp.
Type: Fun-fly aircraft
Price: $84.95
Wingspan: 46 inches
Wing area: 822 square inches
Wing loading: not specified (as built, 8.4 ounces per square foot)
Weight: 3 to 4 pounds (as built, 3 pounds with 3 channels)
Length: not specified (as built, 41 inches)
No. of channels req'd: 3 to 4
Radio used: JR 347
Power req'd: .25 to .40
Engine used: Webra Speed .32
Prop used: Rev-Up 11x4
Airfoil type: thick, semisymmetrical
Washout: not built in
Features: carbon-fiber wing-spar laminate; fiberglass tail boom and landing-gear struts.

Hits
- Simple construction methods
- High-quality wood selected and graded for specific areas of use
- Lightweight
- 5-page check-off construction sheet
- Remarkable flight performance

Misses
- No photos of construction or completed airframe.
- Minimal hardware.





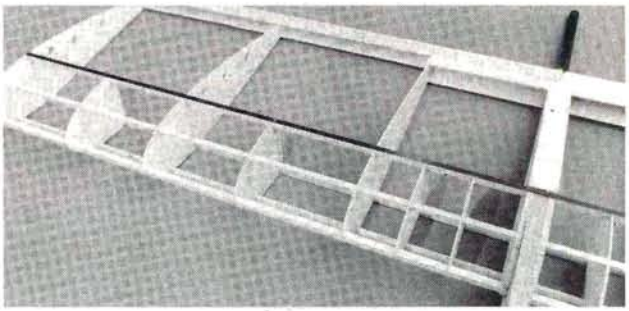
Left: the engine pod, the landing-gear strut spacers, the landing-gear legs, the 3-inch wheel and the engine with the prop are temporarily laid out to mark the location of the engine and the landing-gear legs. Far left: the contents of the kit.

tions. Assemble the two legs according to the plans, and drill mounting holes in them. With that done, put your engine (with the appropriate prop mounted on it), landing-gear legs, landing-gear spacer struts and a 3-inch wheel onto the plywood engine pod (see Photo 1) and position the landing gear so that they're at a slightly forward angle with adequate clearance for the prop. Now mark the position for the engine mount and landing gear leg attachment holes. Drill the holes, cut the engine slot and test-fit everything. If necessary, make adjustments and then put the parts aside for later assembly.

The construction sequence for fitting the fiberglass tail boom to the engine pod is very straightforward, so just follow the instructions. Next, splice together the two 36-inch-long, ¼-inch-square balsa spars to make one 46-inch-long spar. (Use one spar at its full length and use 10 inches of the other.) This makes the joint fall on the outer portion of the wing where there is less stress. When installing the spars, place the joint sections on opposite sides of the wing.

To join the two parts of the spar, I used a razor saw miter box to cut the surfaces on a 45-degree angle, fitted the two pieces together and glued them with Satellite City* Hot Stuff. At first, I was skeptical of this method, but the next step is to use CA to laminate the spar with carbon-fiber tape. When this has been completed, the spar is much stronger, and my doubt about the joint was eliminated.

From here, the wing is built flat on a board directly over the plans. The layout is simple: there are only four full-size ribs per wing panel and four false ribs that are cut out of extra full ribs. Once in place they are capped at the rear of the rib with 1/16-inch to ¼-inch capstrips between the top and bottom of the ¼-inch-square spars.

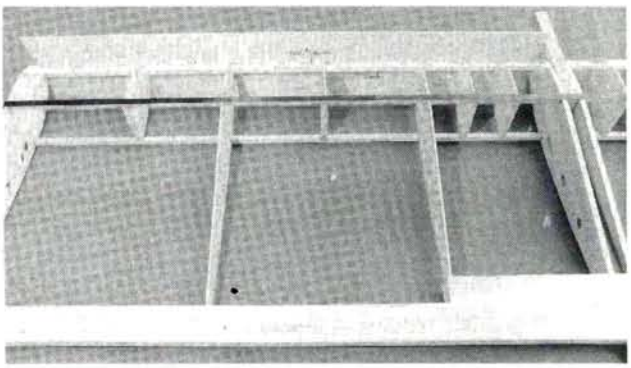


In the partially framed wing, you can see the installation of the false ribs with the 1/16-inch capstrips on the back edge of the ribs between the top and bottom ¼-inch-square balsa spars (notice the carbon-fiber strip on the outside of the ¼-inch spar).

Cut a piece of 1/16-inch sheeting to length and draw a center line along its length and another line ⅛ inch away from the center line, also along its length. Align this second line with the edge of the leading-edge spar, and tack-glue it into place. Now moisten the outside face of the sheeting with a towel or a sponge; this will make the sheeting curl slightly and make it flexible so you can wrap it around the ribs. Starting in the center of the wing panel, use CA to bond the sheeting to the 3/16-inch sub-spars as you go. Repeat the process on the other wing panel.

> The plane handled well...and with its minimal deflections, the plane was very responsive and made tighter loops and quicker rolls than any sport plane.

The leading-edge sheeting is marked with a center line and a second line is added ⅛ inch off center.



The partially framed wing with the leading-edge sheeting, tack-glued into place on the leading-edge spar, is ready to be wrapped around to the 3/16-inch sub spar.

The instructions now take you through final sheeting and cap-stripping. The wingtips are cap sheeted with 1x1/16 balsa sheet. Vertically grained 1/16-inch-thick balsa supports this sheeting and

FUN-FLY OVERVIEW

If you aren't familiar with competition fun-fly planes, you should be; they're truly amazing. With wingspans that range from 42 to 48 inches, they have wing chords of 12 to 13 inches and aileron chords of 4 to 5 inches. Wings of this size have areas of 750 to 850 square inches and a ready-to-fly weight that can range from as little as 2½ pounds to as much as 3¼ pounds. This combination of area and weight produces wing loadings of 11 ounces per square foot to 6.5 ounces per square foot.

The tail group also has large control surfaces; the elevator often has as much surface as the stabilizer. To save the weight of a rudder servo (and the related pushrod assembly), the vertical fin is sometimes used without a functional rudder.

Power for these planes can range from .25 to .40; the target is to achieve as much thrust as possible while using an engine that's light and responsive. Props should be in the 10- to 11-inch range and low in pitch. Fun fly planes usually have one-wheel landing gear—a 3- to 4-inch wheel that's held by two gear legs just below and behind the propeller. This design allows the plane to bump the ground, bounce off and keep on flying.

You can fly these planes with basic 4-channel, non-computer radios using a Y-cord on the aileron channel, but to experience everything these planes have to offer, a computer radio is a must. Set them up with flaperons mixed with up-elevator to produce extremely tight loops; mix the spoilerons with low throttle for rapid descents and spot landings. And when you use extreme throws, e.g., in competition, use exponential for smoother control.

"It can do loops so tight that it looks as if it's trying to bite off its tail; the roll rate is so fast that rolls become difficult to count."

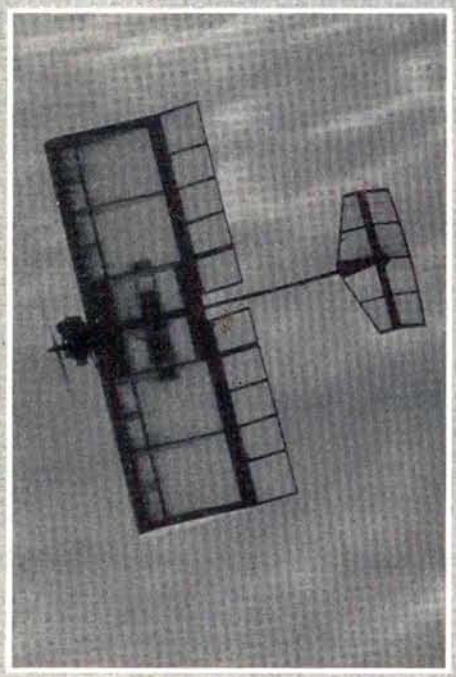
makes a strong, light tip structure. It has been my experience that the wingtip area of any fun-fly plane will get beaten up and abused as you attempt to master those loop touch-and-go's and tight, low turns, so I chose to add carbon-fiber mat to this area for lightweight reinforcement.

CONTROL SURFACES

The ailerons and tail group are of a simple stick construction and are built directly over the plans. The servos, the receiver and battery pack are all mounted on the servo rails—a neat and clever arrangement. The receiver and battery pack are attached to the rails with tie-wraps. The throttle servo is mounted in the bottom wing sheeting after the bottom of the wing has been covered.

FLIGHT PERFORMANCE

- **Takeoff and landing**
Takeoffs happen quickly because of the low wing loading. There's no real takeoff run; simply point the plane into the wind, advance the throttle, and within 10 feet, it's in the air. Landings are a breeze; the airplane can fly so slowly that it floats in like the most docile trainer. If you build the 3-channel version with no rudder, you must get used to using the ailerons for taxiing and ground handling.

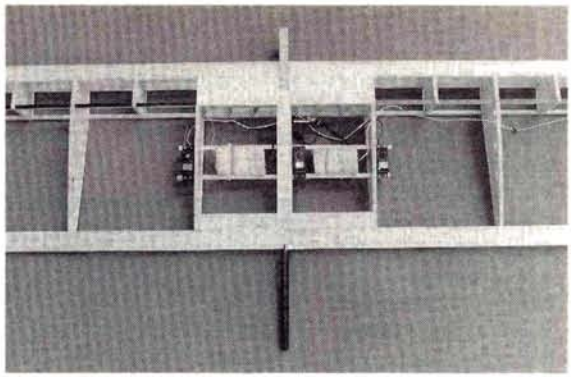


- **High-speed performance**
This plane shouldn't be flown at high speeds because the large control surfaces could flutter and break.

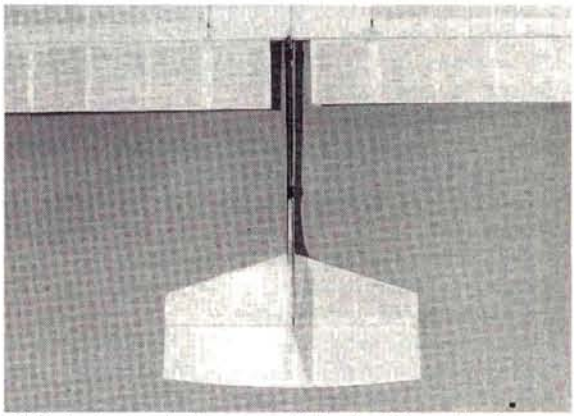
- **Low-speed performance**
Here's where this plane is truly amazing. With its low wing loading, slow, tight maneuvers are totally controllable. At *very* low speeds and in a steep bank, the wing will stall (the nose will drop straight forward with no tendency to snap), but the addition of moderate power makes recovery quick and controllable.

Dead-stick flight is smooth, with complete control. In dead-stick flight, I leave the throttle forward so I don't deploy the spoilerons. In a stiff breeze, you should lose altitude quickly because the plane's lightness and thick leading edge will cause the plane to lose air speed quickly.

- **Aerobatics**
Loops at full power are very tight and the plane shows no tendency to snap out. Inverted flight is smooth and very predictable. The review plane was built without the optional rudder; with it, true tight flat spins are common—and a sight to see. This plane is quite rugged, taking into consideration that every effort was taken by the designer to make it as light as possible.



The wing structure, with the radio gear installed, is ready to be covered.



Tail structure and ailerons are of simple stick construction.

COVERING

I chose Coverite's* light, strong Micafilm. Wait! Before you actually cover, you must be sure all servo and related receiver connections are properly made and that everything functions correctly, because once you've covered the wing, you can't access your radio gear without cutting away the covering material.

I covered the bottom of the wing first. Before starting the top, I installed and connected the throttle servo in the bottom wing sheeting while I still had access to the receiver through the uncovered top of the wing. When the top of the wing has been covered, only the servo-arm output shafts are exposed through the covering. This may sound difficult, but it really isn't. Simply cover the wing as if the servos weren't there and, just before final tightening or shrinking of the material, carefully cut the holes for the servo arm shafts to come through. Then you can do the final tightening and cover the ailerons and the tail surfaces.

Epoxy the ½-inch fiberglass locating collar to the .414-inch-diameter sub-boom. Lightly sand and clean all areas of the sub-boom that will have glue joints. Follow the instructions, and study the plans for the placement of the collar. Epoxy the collar into place, and wipe off the excess epoxy. Put the collar aside and let it cure.

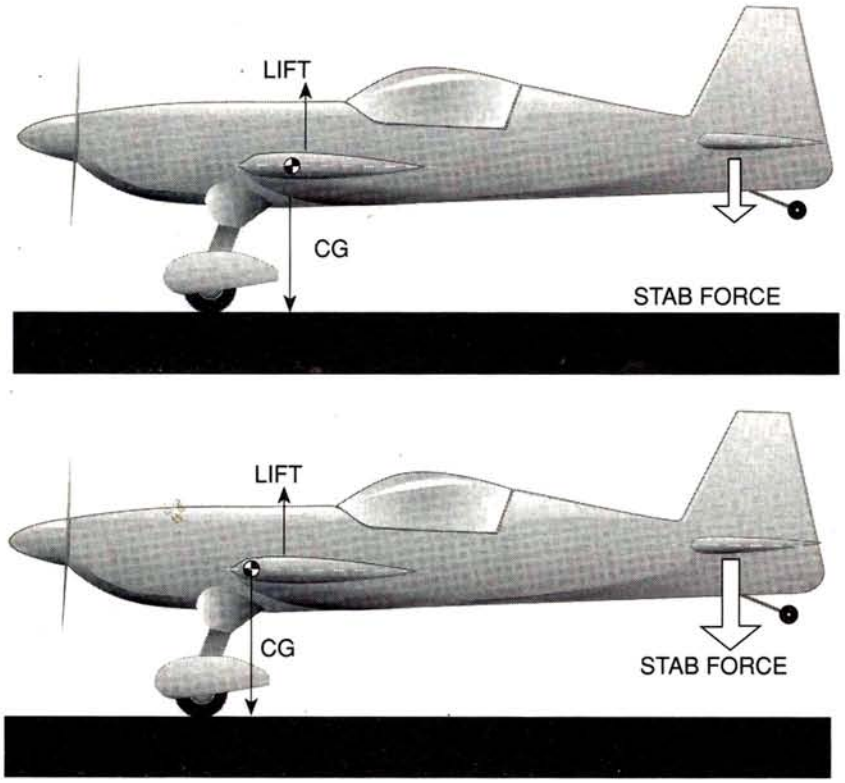
The stab and fin can now be epoxied to the sub boom. For a strong glue joint, you must remove the covering material from the stab and fin in the areas that will contact the boom. Use epoxy for these joints, and be sure to align the tail group in all directions. With the sub boom and tail surfaces totally assembled, you can epoxy the sub boom into the main boom. Use plenty of epoxy and be sure that the stab is level with the wing. Put the assembly aside and allow the joint to cure. *(Continued on page 88)*

AEROBATICS MADE EASY

DAVE PATRICK

CONFIRMING PROPER CG

LAST MONTH, we discussed how to measure and calculate the position of the CG to properly balance your aircraft. This month, I'll review what happens when you move the CG and how you can tell when it's properly located for your particular flying style.



As the CG is moved forward, creating a more nose-heavy plane, the downward lift or stabilizer force generated by the stab must increase. Moving the CG forward creates inherent stability, but there are limits (see text).

Always start with the manufacturer's recommended CG position. Usually, designers show a range for the CG on the plans, and the rearmost position shown is generally forward of the actual aft limit. This allows for measurement errors by builders.

BASIC AERODYNAMICS

Let's talk basic aerodynamics so that we can understand what's happening and understand the forces that are involved. Conventional airplanes are usually "nose-heavy" and have stabilizing tails that keep their noses up. This works well. If you increase air speed (as in a dive), you get more stabilizer force, i.e., downward lift, and your aircraft automatically pulls out of the dive. Alternatively, if your plane's nose is too high, air speed will diminish, "stabilizer force" will lessen, and the nose will come down to allow the airspeed to build again. We'll call the the ability of the aircraft to stabilize itself "inherent stability."

The relationship between stabilizer incidence and a CG that creates a slightly nose-heavy airplane can have a dramatic effect on how the aircraft flies. In some instances, we can increase the inherent stability of an aircraft by moving the CG farther forward and correspondingly increasing the stabilizer force by marginally increasing the stab's negative angle.

There are limits to how far you can go; if the plane is too nose-heavy, you may have difficulty keeping its nose up when flaring for a landing. The stab—already fighting to keep the nose up—loses stabilizer force as air speed diminishes. If you have a very nose-heavy airplane, you may have to maintain a very high approach speed on landing to keep the nose up. This is not desirable for a trainer aircraft.

CG FOR AEROBATICS

A nose-heavy CG position is great for trainers, since we want plenty of inherent stability to make the aircraft forgiving for the low-time pilot. On the other hand, we don't want to fight against inherent stability during aerobatic maneuvers. The aerobatic pilot will therefore carefully move the CG aft when setting up the plane.

In fact, the aerobatic pilot will carefully move the CG around to find the optimum balance between aerobatic agility and stability. If the CG is placed too far aft, the aircraft may become inherently unstable and very difficult—if not impossible—to control.

Let's look at a few indications that the CG is correct for aerobatics. First, trim for straight and level flight at full power. Then pull the nose up—let's say about 30 degrees—and let go of the controls. If the aircraft continues to climb at the same angle, that's a good start. It should also maintain its course in a shallow dive. This will show that you don't have too much inherent stability.

When you roll the aircraft inverted, it should require about 10 percent down-

(Continued on page 96)

MODEL AIRPLANE NEWS MAGAZINE

FIELD & BENCH REVIEW

SIG Samurai

A SOARING WARRIOR

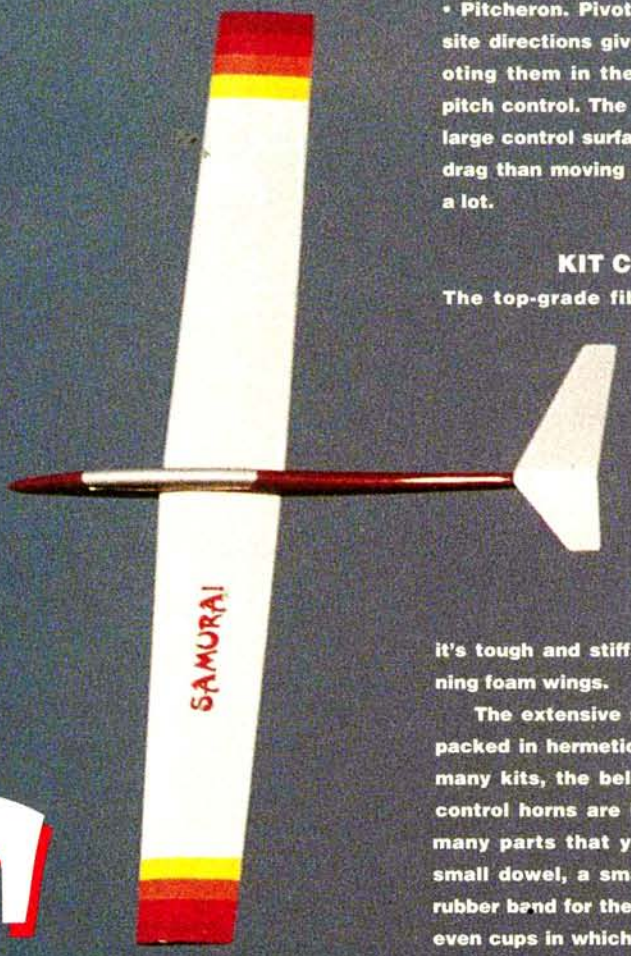
by DAVID D. GARWOOD

THE SIG* SAMURAI is a sleek, high-performance, slope-soaring sailplane, and my experience with the Ninja (another Mike Pratt design) gave me confidence that this one would be easy to build and would fly well.

The Samurai is designed for either of two control configurations:

• Wingeron. Pivoting the left and right wings in opposite directions gives roll control, and a traditional elevator gives pitch control.

• Pitcheron. Pivoting the wings in opposite directions gives roll control, and pivoting them in the same direction gives pitch control. The theory is that moving a large control surface slightly creates less drag than moving a small control surface a lot.



KIT CONTENTS

The top-grade fiberglass fuselage and separately molded canopy are a delight to see and hold. The gray foam cores are smooth, and the 1/64-inch plywood wing skins come cut to shape. Plywood is expensive, but because it's tough and stiff, it's excellent for skinning foam wings.

The extensive supply of small parts is packed in hermetically sealed bags. As in many kits, the bellcranks, a pushrod and control horns are included, but there are many parts that you wouldn't expect—a small dowel, a small piece of wire and a rubber band for the canopy hold-down, and even cups in which to mix epoxy and cardboard stock for the mounting templates.

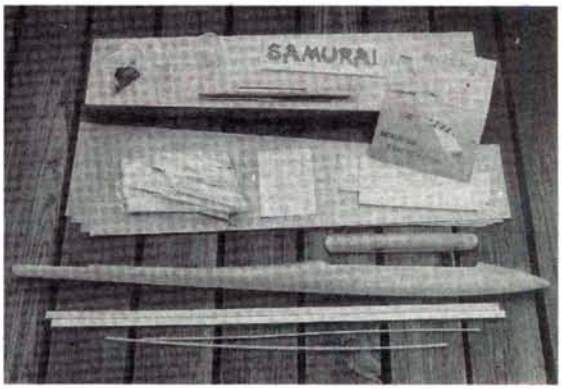
This is a luxury kit containing high-quality fiberglass moldings, balsa, plywood, and cut parts. The attention to details is stunning.

The instructions are clear and complete. The 20-page manual contains 68 photographs and 29 diagrams, and it covers foam-wing construction so thoroughly that a first-time foam-wing builder could succeed with it. This is a luxury kit containing high-quality fiberglass moldings, balsa, plywood, and cut parts. The attention to details is stunning.

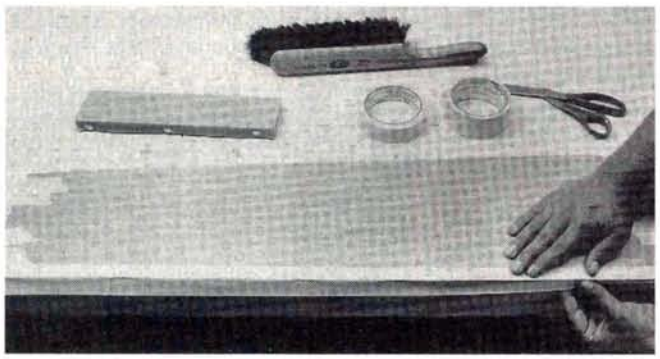
CONSTRUCTION

The wing is built of 1/64-inch plywood over gray foam-cores. As recommended, my sheeting adhesive was epoxy. In each wing, the joiner/pivot system consists of a balsa box that holds a brass tube that receives the 5/16 steel wing rod, and the wing rod goes through the fuselage in a brass tube.

My only building problem was a slight bend in the 5/16 music-wire wing rod. Barely noticeable, it was enough to cause friction in the wing-pivot mechanism, so I called the Sig Hotline*. They explained that wing-rod stock comes in 4-foot rolls, and though it's put through a straightener, it's sometimes still curved in the kits. They advised me to set the wing rod in a pair of vee-blocks and then flatten it with a hammer, noting that some heavy blows might be needed. This worked, and the wing now pivots freely with a straight joiner rod. (Sig Hotline staff also recommended that I wax the wing rod.)



The kit includes a premium-quality, molded-fiberglass fuselage, gray foam wing-cores, 1/64-inch plywood wing skins, die-cut plywood parts, all hardware and a logo-type sticker.



Construction tip: tape a pair of wing skins to the bench, and tape the trailing edges together. This accurately positions the skins relative to each other, and it gives just the right amount of clearance at the training-edge temporary hinge.

Construction and radio installation took 17.75 hours, and the finishing color coats and trim paint on wings, fuse, canopy and stabs took another three hours. Real slope models are painted, not covered.

When completed, the wings slide off and the tail plane is unbolted for storage and transportation. If a builder changed the vee-tail to a two-piece design, the disassembled Samurai would fit back into its original box.

Fuselage construction goes quickly: start with an initial sanding and spraying of primer; fill minor pinholes with automotive glazing putty; sand again; spray on more primer.

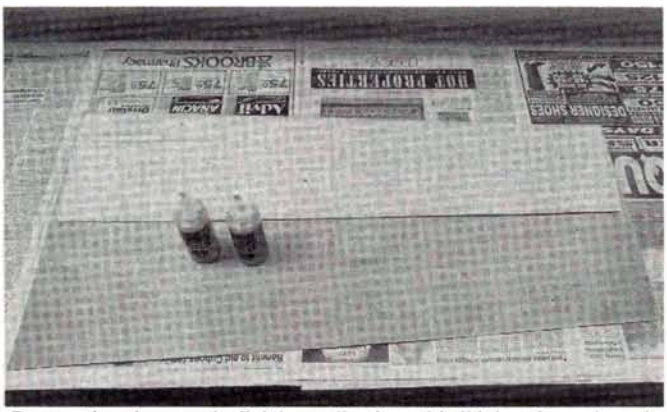
Plywood doublers that serve as servo-rail guides were epoxied to the fuselage sides. The templates provided let me drill holes accurately for the wing mount and movement system, so servo and bellcrank mounting was simplified and precise.

I built the pitcheron version, and the fixed, vee-tail-stabilizer construction is about as easy as it gets. Just glue two pre-cut elevators to the pre-cut stabilizers, then sand and glue these vee-tail halves to a plywood base and a specially made angled joiner block. The wingeron version would have required that I hinge elevators (Sig EZ hinges are provided) and install a control pushrod (also provided).

Final-sand, spray on some primer and you've finished.

RADIO INSTALLATION AND CONTROL SYSTEM

Very precise, high-torque servos are required to move the wings: one single 65-ounce-inch servo for wingeron control and a standard servo for elevator.



Prepare the wing-core by lightly sanding it, and build the wing-rod receiving box and spar out of the die-cut balsa parts. Sig recommends the use of epoxy to attach the wing skins to the cores, and mixing cups are included.

SPECIFICATIONS

Type: Advanced slope-soaring sailplane
Wingspan: 67 inches
Wing area: 477 square inches
Weight: 36 to 38 ounces specified; 41.5 ounces as built
Wing loading: 12.5 ounces/square foot as built
Power req'd: None
Airfoil: RG-14 (semi-symmetrical)
Rec. no. of channels: 2 (pitch and roll)
Sug. retail price: $142.95

Features: *ultra*-complete, super-quality kit. Option of control by wingeron and elevator, or pure pitcheron with a fixed tail plane. Slender fuselage and vee-tail contribute to attractive appearance and low drag.

Hits
- Pivot wing gives smooth, solid control
- Wide speed range; adaptable to wide variations in lift conditions
- Outstanding aerobatic performance
- Can be disassembled for easy storage and transportation.

Misses
- None. Sig really got this one right.

PHOTOS BY TOM ATWOOD and DAVID D. OAKWOOD

or a pair of 50-ounce-inch servos for pitcheron control. I use a pair of Airtronics* 94735 "7 Series" servos; these servos have dual ball bearings and coreless motors.

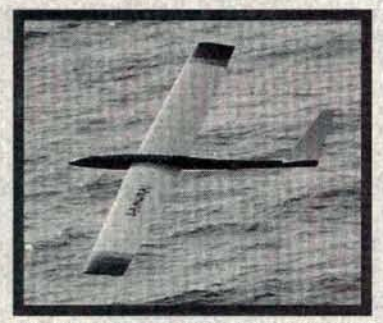
Elevon mixing on my pitcheron Samurai is handled by an Ace R/C* Christy mixer. If elevon mixing is done in the transmitter, you can use a full-size receiver, but with the Christy mixer on board, I had to fit a miniature receiver. I use an Airtronics 92245 4-channel unit. Note that with the wingeron version, no servo mixing is needed, and the simplest of aircraft radios will control the Samurai.

To make it fit more easily through the fuselage opening, I modified a standard 500mAh battery pack from a square to a diamond shape. With radio installed, the model needed 1.5 ounces of nose weight to balance as specified. This gives a flying weight of 41.5 ounces—3.5 ounces more than the recommended range of 36 to 38 ounces, mainly because of the wings' painted finish (durable, but heavy).

FLIGHT PERFORMANCE

- **Launching and Landing**

Although the mid-wing location forces you to grip slightly behind the Samurai's natural balance point, it's easy to launch, and it gathers speed quickly. In lift, altitude is gained without effort, and converting altitude into speed is a simple matter of lowering the nose a bit. Landing takes planning and concentration, because even the Samurai's slowest speed is considerable, and the mid-wing attracts more landing dings that a high wing. On reasonably flat landing area, the Samurai can be brought down repeatedly without damage by keeping the wingtips level, raising the nose to reduce speed, and scraping the plane along the ground until it stops.



The Samurai over Cape Cod Bay. (Photo by Louis Garwood.)

- **High-Speed Handling**

The semisymmetrical airfoil and slippery fuselage let this airplane pour on the speed, and it's really at ease when travelling fast. Of the 24 sailplanes I've built and flown, only one is faster, and none is as relaxed at speed.

With the recommended control throws there is no lack of control and no tendency toward over-control. The model comes into its element when the wind speed climbs above 20mph. In 35mph wind, I didn't have to make changes to control throws or flying weight.

- **Slow-Flight Characteristics**

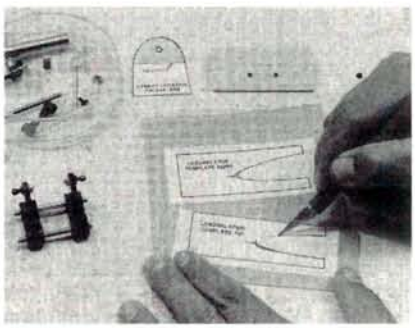
It flew much better than I expected for a sailplane that goes this fast. The Samurai never tip-stalled in turns, and forward stall was remarkably uneventful—a little bobble and then forward again with no tendency to fall off to the side. I was amazed at how little lift was required to sustain flight, and further amazed at how docile the Samurai was at low speed. The in-flight photographs were taken in a mere 15mph wind on a 65-foot coastal hill, and even those moderate lift conditions allowed careful rolls and loops.

- **Aerobatics**

This plane does all you can do with two channels—loops, rolls and combinations such as Immelmann turns, Split S's and Cuban-8s. It flies very well inverted, easily tracing the entire figure-8 slope pattern. Moreover, the Samurai does all this with a polished smoothness and grace that you must experience to understand. This sailplane makes you look like a better pilot than you are.

FLIGHT TESTING

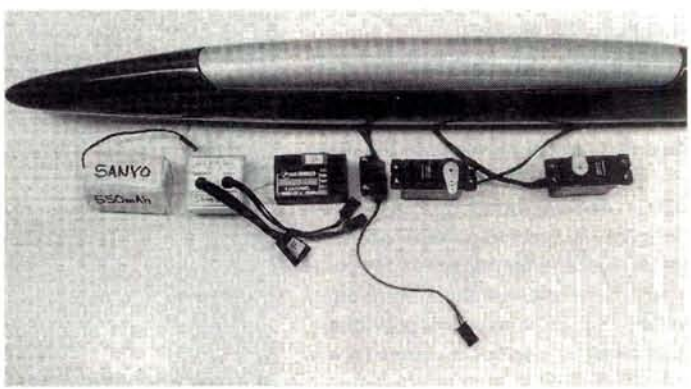
Confident of Mike Pratt's design and encouraged by the super quality of the kit, I skipped the usual flatland testing and launched from a 90-foot hill into a 20mph wind. The Samurai flew really well from the moment of release. I made no trim changes until after five or six passes, and then they were minor.



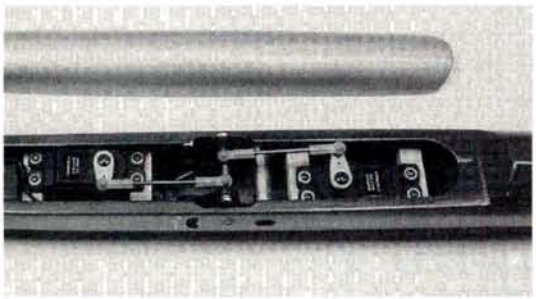
Shown with hardware are the four templates that help with accurate construction. The templates are glued onto the card stock provided and cut out by the builder. The template at the top is used to position the holes that will be drilled through the fuselage sides.

The Samurai's speed and smoothness were impressive. There was no vee-tail wobble and no shortage of pitch control. Loops first—great big loops and fast tight loops; then rolls—fast rolls, slow rolls; very axial, very controlled. Inverted flight—smooth and completely under control. Immelmann turns? Sure—easy, smooth and precise. Though I've flown four slope planes that will trace the figure-8 slope pattern inverted, the Samurai is my first to *climb* effortlessly while inverted.

The next flying day presented lighter winds, and the Samurai still



This equipment fits comfortably inside the fuselage: standard 500mAh battery pack, Ace Christy mixer, Airtronics 92245 receiver, switch harness and servos.



Fuselage with radio gear installed, showing servo linkage and wing-control bellcranks.

flew well in 15mph on a 65-foot hill. Aerobatics were subdued, but still possible in the lighter lift.

The third flying day gave us a 20 to 25mph wind on a rather marginal 45-foot hill. I was able to fly the Samurai inverted as long as I wanted, and its solid flight performance allowed me to confidently turn the sticks over to three flying companions.

Rick Lawrence—originally a fuel-power pilot—flew five slope sailplanes that day and said of the Samurai, "It's staggering how smooth it flies. It's responsive and not at all twitchy. It's probably the hottest ship I've flown, except for a few pattern models, and the Samurai is stable enough to hand off the transmitter—something you can't do with a pattern ship. It has no bad habits except that it lands fast."

Al Dion—a coastal flying buddy from Connecticut—remarked, "The Samurai is the smoothest thing I've ever flown. It behaves *so* well. It has fantastic response in high wind, climbs like a rocket, makes super turns and responds to the controls with no hesitation."

Mike Schindler—a 24-year pattern flier and pattern contest director—said, "It's very smooth and very responsive at the same time. It has no adverse yaw and rolls clean; it didn't corkscrew. The translation between control input and the way it responds is excellent. It just *felt* really good."

This model can be built quickly, it looks great and flies superbly. The Samurai is a "must have" model for serious slope fliers.

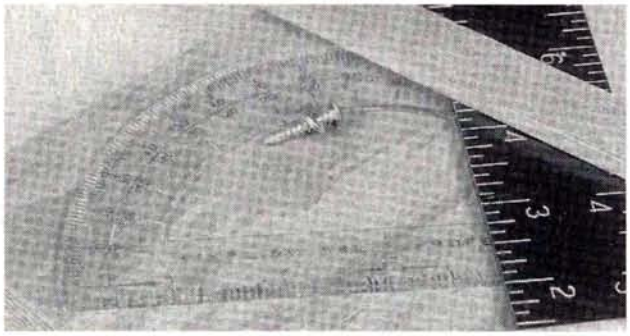
**Here are the addresses of the companies mentioned in this article:*
***Sig Mfg. Co.,** 401 S. Front St., Montezuma, IA 50171; (515) 623-5154*
***Sig Hotline:** (800) 524-7805).*
***Airtronics Inc.,** 11 Autry, Irvine, CA 92718; (714) 830-8769.*
***Ace R/C,** 116 W. 19th St., P.O. Box 511, Higginsville, MO 64037; (800) 322-7121.* ■

How To:

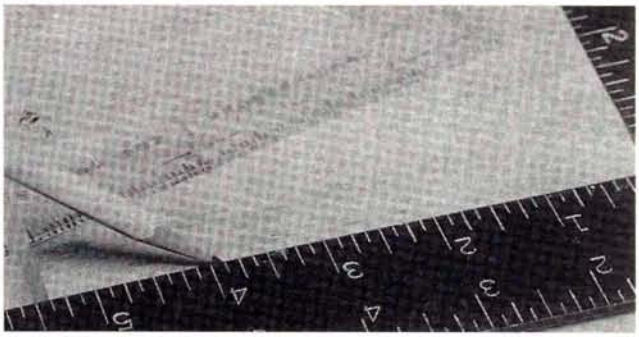
RANDY RANDOLPH

MAKE AN ANGLE SANDING JIG

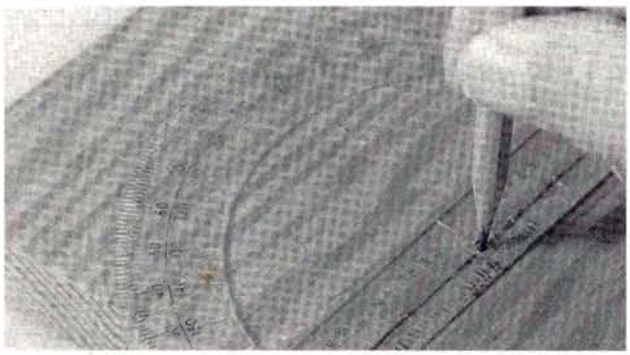
WHEN YOU build a wing, you're always told to trim the spars to the dihedral angle. Even if you use the angle shown on the plans as a guide, it's a difficult job to do accurately. The photos show how to make a simple jig that will help you complete this task quickly, easily and accurately.



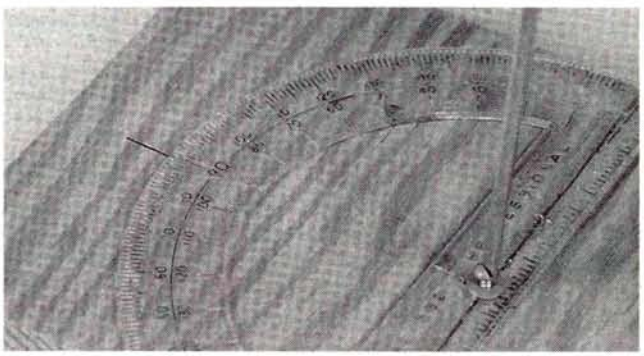
1. You'll need: an inexpensive plastic protractor; a no. 4 wood screw with a washer; a six-inch-square piece of hardwood that's at least ¾ inch thick; a sanding block; a square; a pencil; a drill; and a screwdriv-



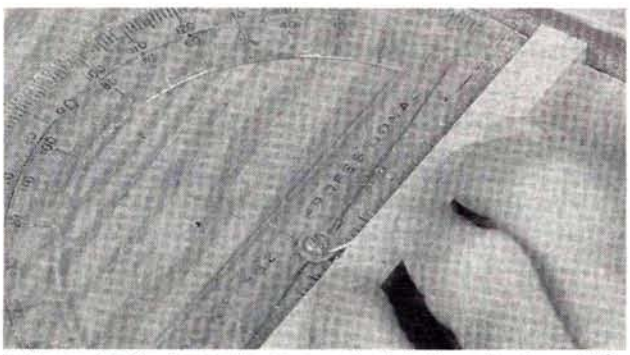
2. Make the jig base by drawing a line perpendicular to a smooth, straight side of the hardwood. You can use a protractor to draw this line, but a square enables you to do the job faster. Call this the base line.



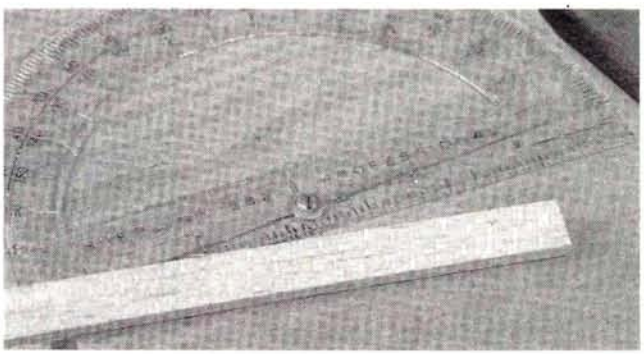
3. If there's no hole at the center mark of your protractor, drill a 3/32-inch hole there. Align the protractor with the base line so that its right edge is even with the edge of the base, i.e, at the right side of the wood, and mark the position of the hole on the base line.



4. Attach the protractor to the base with the wood screw and a washer at the position marked. Again, align the protractor with the base line and draw a line at the 90-degree mark above the protractor. This is the pointer.



5. To use the jig, loosen the screw and rotate the protractor until the pointer indicates the degree of dihedral needed (in this case, 5 degrees), and tighten the screw. Hold the spar stock against the bottom of the protractor, and while holding the sanding block against the edge of the base, sand the angle into the spar.



6. The result is an accurate bevel on the end of the spar stock. You can also use this jig to make plywood dihedral braces to match the spars. In fact, you can use it any time you need uniform bevels. You'll wonder why you didn't make one years ago!

MODEL AIRPLANE NEWS
FIELD & BENCH REVIEW

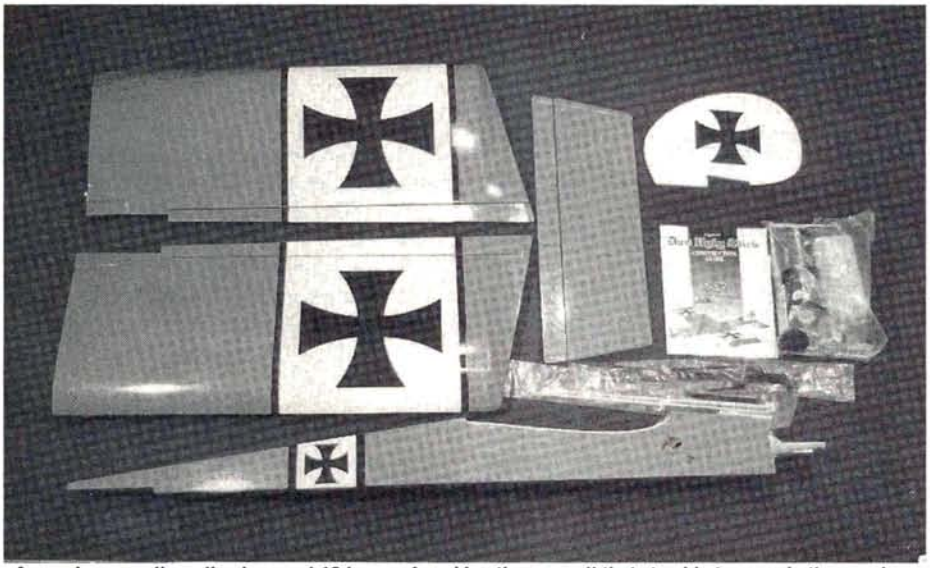
ARF Version of an old favorite

PHOTOS BY GEORGE VOSS

DAS Ugly Stick

by GEORGE VOSS

The original Das Ugly Stick has been around for almost 30 years. Coast to coast and around the world, this is probably the most popular sport plane ever designed. HD has taken the original Phil Kraft design and recreated it in an almost ready to fly version. They have done the building for you and left in all the fabulous flying traits that made the Stick famous.*



An engine, a radio, adhesives and 10 hours of working time are all that stand between what's seen here and the flying field.

THE KIT

The kit contains nearly everything needed to complete the basic airframe. Each wing half and the fuselage were packaged in individual plastic bags. The stab and rudder were in another. The wing halves and stab/rudder bags were separated with bubble pack and the fuselage had its own compartment. The kit was well packed and no damage was noted.

The Stick is built with materials and methods familiar to the sport flier—balsa, ply and hardwood. The wing has a symmetrical airfoil with "D"-tube construction using hardwood spars. The fuselage is balsa with plywood doublers. The tail feathers appear to be all balsa. All factory construction looked very good.

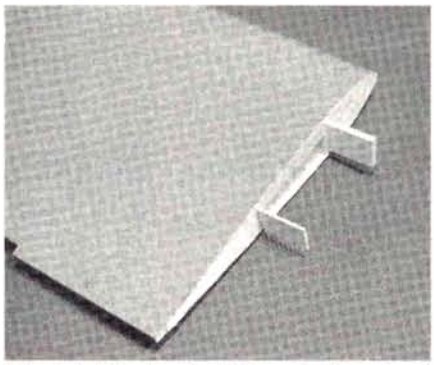
There are no plans included, as none are needed. The 8-page assembly manual guides the builder through assembly in logical sequence, utilizing 30 photos. All the typical caveats are there, such as making sure the tail feathers are installed plum and square. Many little hints are also included, and this is what I feel sets this manual apart from others.

ASSEMBLY

Assembly consists of joining the five major components into a flyable airframe. I followed the sequence in the manual and no problems were encountered.

WING

The first item on the agenda is the wing. All that is required for wing assembly is to join the wing halves using the supplied dihedral braces, install the ailerons and aileron servo mount. I chose to install all the movable surfaces after basic assembly. I epoxied the two forward and one aft dihedral braces in place and epoxied the two wing halves together, installed the aileron servo mount and the center section PVC tape. In less than an hour, I had an assembled wing!



Prior to joining the wing halves, the forward and rear dihedral braces are installed in one wing panel. The fit at the root section is snug.

FUSELAGE

Fuselage assembly begins by installing the tail feathers. I trimmed the covering from the stab mount area and lightly sanded the fuselage platform to achieve proper alignment. I trimmed ⅛ inch from the bottom of the fin to achieve the proper fit in the fuselage. I trimmed the covering from the lower portion of the fin and also from the area aft of the fin slot in the fuselage. I made sure

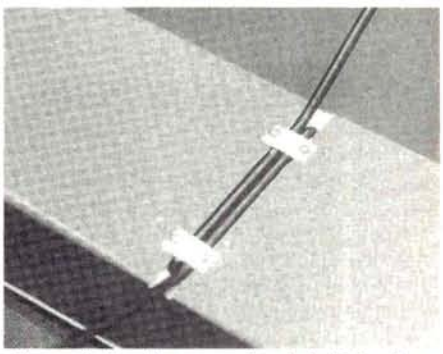
SPECIFICATIONS

Model Name: Das Ugly Stick
Manufacturer: Long Tai Shin Industrial Co., Ltd.
Type: Sport ARF
Price: $189.95
Wingspan: 60 inches
Wing area: 767 inches
Wing loading: 19.5 ounces per square foot
Weight: 6½ pounds
Length: 53¾ inches
No. of channels req'd: 4 (throttle, aileron, rudder and elevator)
Radio used: Airtronics Championship 7
Power req'd: 60 2-stroke or 120 4-stroke
Engine used: O.S.* .61
Prop used: 12-6 Master Airscrew*, 12-6 APC*
Airfoil type: symmetrical
Washout: not built-in
Wing construction: balsa/hardwood/spruce "D"-tube
Kit construction: balsa/ply conventional construction
Optional accessories used: none

Features: the kit comes with all hardware and factory-built, balsa/ply, film-covered fuselage, wing and tail parts. It's quick and easy to assemble, and it has exceptional flying characteristics.

Hits
- Complete hardware package
- High-quality construction
- Short assembly time
- Outstanding flight characteristics
- Reasonably priced

Misses:
- Minor packaging error (one wheel collar missing)
- Throttle wire was too short
- Landing-gear wire should be stiffer



The main landing-gear wire is held in place with nylon straps. Be sure to drill the hardwood mounts for the strap screw.

FLIGHT PERFORMANCE

The ship balanced according to the instructions, without the addition of any weight. The assembly time from box to field was less than 10 hours. The HD Das Ugly Stick is really almost ready to fly!

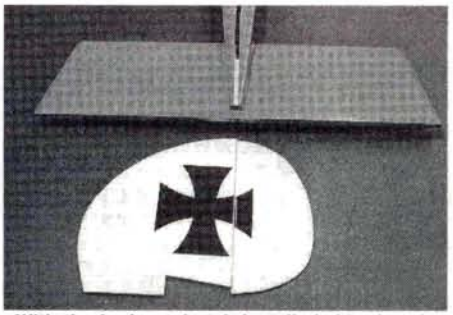
My chief test pilot, Masters-class flier Larry Oakley performed flight tests and photo flying duties. Ground handling was checked with a few high-speed taxi runs. I gave Larry the thumbs up, and he poured the coals to the Stick. About 100 feet later she rose gracefully into the cool morning air. It was obvious that there was no lack of power. A few clicks of trim had the ship flying straight and true.

- **Takeoff and landing**
  Thanks to the wide gear stance and firm foam tires, the ground handling is excellent. The Stick will take off at ½ to ¾ throttle with an O.S. .61 or an ASP .61 swinging a 12x6 APC prop. One of the Sticks fortes is landing. On final with the throttle slightly above idle, the ship seems to be on rails. Barring any crosswinds, it's nearly hands-off to the flair.

- **High-speed flight**
  While not in the pattern class as far as speed is concerned, this ship thrives on being solid. At no time did the Stick do anything "squirrely" or feel out of control. Even abrupt maneuvers at speed were solid with no sign of tip stalls or snaps.

- **Low-speed flight**
  This is where the Stick is in its element. This ship flies beautifully in slow flight. No bobbles, no porpoise, just solid smooth flying. The rudder is very effective at all speeds. In fact, you can safely fly the stick on rudder and elevator. Stalls are mushy and straightforward. You have to force a stall. With full up-elevator, I had to completely chop the throttle before the stall break would occur.

- **Aerobatics**
  Loops are no sweat. Big or small, the Stick doesn't care. Rolling maneuvers require rudder correction due to the amount of dihedral in the wing. This roll coupling is acceptable in exchange for the stable flight characteristics. Knife edge requires careful coordination of the ailerons and rudder, again because of the dihedral. These are not meant to be negative comments—on the contrary. The Stick does exactly what it's supposed to do. It's a stable-flying platform for the sport flier.

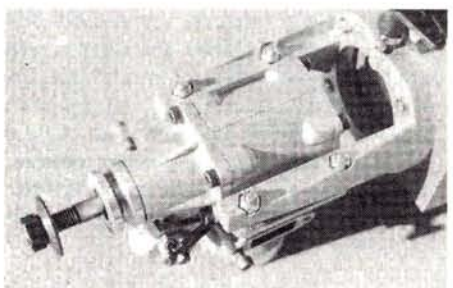


With the horizontal stab installed, it's time for the fin and rudder installation. The covering is removed from the lower portion of the fin and aft of the fin slot in the fuselage. This ensures good wood-to-wood contact for solid glue joints.

everything was aligned properly with the wing and glued the stab and rudder in place.

Landing gear installation came next. The nose-gear wire fits in the factory mounted bracket and engine mount. The wire has raised serrations where the steering arm and retaining collar are mounted. This helps to prevent rotation of the collars if a setscrew should come loose—nice touch! A light tap with a hammer gets the steering arm on the nose gear.

I pre-drilled the holes for the main gear retaining-strap screws and installed the main gear. The main gear straps could stand to be a little longer, as the strap mount holes end up very close to the gear wire. Wow! In only 2½ hours, I'm ready to install the radio, tank and engine!



The bottom of the engine mounts are recessed for the engine-mounting nuts—just one of the many nice touches found on this kit.

TANK AND ENGINE

Prior to installing the 14-ounce fuel tank, I fuelproofed the tank and radio compartment with Black Baron Clear shot from a spray can. The tank features a thread-on cap instead of the common compression type.

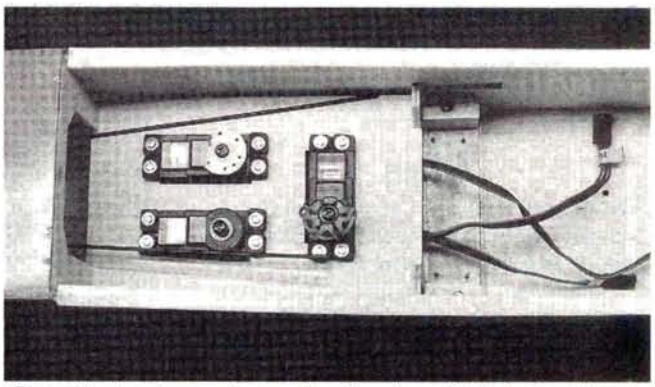
"It's fast-building, strong and straight. The flight characteristics are smooth, stable and rock steady."

This made tank assembly and installation quick and easy. I applied silicone adhesive around the cap and installed the tank in the fuselage.

The engine is retained on the mount by two metal straps. I was apprehensive of this system, but it has proved reliable throughout all testing.

RADIO

I installed my '91 updated Airtronics* Championship 7 Series radio in the Ugly Stick. The radio compartment is



Obviously, there's room to spare for all equipment. The tank easily slips into its compartment and is held in place by former no. 2 and silicone glue. Note hardwood blocks at the center of the compartment into which the main gear are mounted.

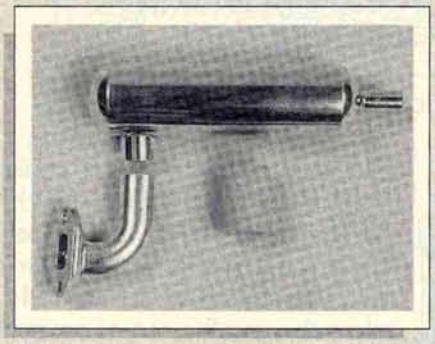
3¾x12½x3¼ inches. Needless to say, there is plenty of room for any modern radio gear.

The pushrods are made of ¼-inch wooden dowel. They are pre-drilled and slotted for the 1/16-inch music wire—another nice touch. Heat-shrink tubing is supplied to give a finished look to the pushrods after the wires are epoxied in place. I wrapped the pushrods with thread prior to installing the heat-shrink tubing. The instructions tell you to have the elevator and rudder pushrods exit the fuselage on the same side as their respective servos. This didn't look like the best way to me, so I crossed them.

The wire supplied for the throttle was not long enough to make the trip between the servo and throttle connection. I soldered a threaded coupler to one end of the wire and that solved the problem. The nose-gear steering wire length allows for no bending errors. I made an error and had to splice a 3-inch section to cover the distance. The landing-gear wire supplied in my kit wasn't as stiff as piano wire of the same diameter. I had to bend the main gear back in place after just two landings. Even out of the box, the

(Continued on page 96)

NEW HELI PRODUCTS



MINIATURE AIRCRAFT USA
Magna Nitro Pipe Set .30 and .40

This Magna Nitro Pipe Set is designed especially for .30 and .40 helicopters. These pipes will reach peak power using fuels with a variety of nitro percentages. The set features a wide power band, low noise, easy installation and a streamlined look when mounted. It also includes a header and mounting hardware.

Part no. 3982

Price: $69.95

Miniature Aircraft USA, 2324 North Orange Blossom Tr., Orlando, FL 32804; (407) 422-1531.

WEBRA
.32 Red-Head Engine

Webra's new helicopter engine is a modified, more powerful version of its original .32. It has a newly designed carburetor with a 7.5mm bore to allow more fuel/air mixture into the combustion chamber. A one-piece, machined-aluminum throttle lever enhances reliability and wear; and a single O-ring seal on the high-speed needle ensures more consistent operation. These modifications allow at least 1,000 more top rpm than other .30 heli engines. Its features include: dual ball bearings that support the crankshaft (for super-smooth operation and durability); an aluminum piston, a brass sleeve and a Dykes ring (for an efficient, durable, powerful piston-to-sleeve seal). A bright-red-anodized, finned heat-sink head promotes cooler, more efficient running. The engine comes with a two-year warranty.

Price: $189.95

Webra is distributed by Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign, IL 61821; (217) 355-0022.

GREAT PLANES
Low-rpm Concept 60 Clutch Drum

Made of machined aluminum like the standard Concept 60 clutch drum, this low-rpm drum has a thicker wall, so there's less space between the clutch and the liner. This allows a more positive engagement, especially at lower rpm, and it's especially suitable for use with Concept 60s that have modified engines. The drum's liner is made of the same Kyosho fiber as that on the original. You'll notice a difference immediately when the clutch engages and the rotor starts to turn at lower throttle-stick positions.

Part no. KYOE7557

Price: $34.95

Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826; (217) 398-6300.

1992 Scale Mas

A GATHERING OF OLD PROS AND WELCOMED NEWCOMERS

Perennial scale winner Charlie Nelson missed continuing his incredible winning streak by half a point! His magnificent YKS Waco Cabin must be seen to be appreciated. A larger version is almost ready for future competitions.

Roy Vaillancourt's Stinson L-5 Sentinel. Roy offers plans and accessories for this gentle flying Warbird.

Flap and speed brake position on Kent Nogy's F-86 indicate that Kent has just executed a near-perfect touchdown and is keeping the nose up to bleed off air speed.

by RICH URAVITCH

NO QUESTION about it; scale modelers love scale models, sport modelers love scale models, even non-modeling spectators love scale models—all probably for different reasons, but nevertheless, the fascination with scale models is undeniable. This became especially clear at the 1992 edition of the U.S. Scale Masters competition, where 51 of the country's top scale builder/fliers convened for the "showdown"—the culmination of a full schedule of local "qualifier" meets at which it was determined just who would make it to the finals.

This year's edition returned to Irving, TX, the site of the 1990 event. The field is home to the host club, the Irving R/C Flyers, and it's one of the nicest permanent facilities around, boasting a long, wide (sometimes not wide *enough* for some of us!) blacktop runway, paved taxiways and separate fliers' boxes. For four days last September (17 through 20), contest director Ernie Harwood and his band of volunteers saw to it that participants and spectators alike got first-class treatment for the event.

Primary sponsors were Pacer Technology (the folks who bring you

sters

The "Daring Damsels" on the wing of Chuck Fuller's Super Stearman seemed to enjoy themselves, even though a good portion of their time is spent inverted!

The youngest competitor of the meet, Tom Polapink, brought this exquisite scratch-built Albatros DVa. He flew it to 8th place and received the C.D.'s Choice award.

The entries of my club, the L.I.Skyhawks. We represented 10 percent of the competitors and returned home with 40 percent of our "fleet" in the trashcan! Tough weekend!

PHOTOS BY RICH URAVITCH

Nick Ziroli Jr. brought his nicely weathered G-62-powered F4U-1 Corsair—Leading Edge Models fiberglass fuselage, wooden parts from his dad's plans.

all those Zap products) and the Dallas-based Sport Flyers Association. Pacer's Herschel Worthy confided that, despite the recession, Pacer still felt an obligation to continue sponsorship of this prestigious event as a way of showing their appreciation for the support of modelers over the years. The Sport Flyers Association offers modelers a membership package—some elements of which are truly interesting, dynamic and forward-thinking—as an alternative to AMA membership. It's great for the consumer to have a choice.

With this kind of backing and industry support, and the guidance of Scale Masters program founder Harris Lee, it's easy to see why the event continues to be so successful.

THE AGENDA

The four-day event began with static judging on Thursday and Friday, and flying began on Friday and continued through Sunday. Five rounds of flying were scheduled. Each competitor's two lowest scores were discarded; the remaining three were averaged and combined with his static score to determine his final points. Every point counted and each was hard-fought! Most of the static judging was conducted in the parking lot of the headquarters hotel, causing more than one non-modeler guest to inquire what was going on. Those who took the time to get a closer look at some of the entries were noticeably impressed. We may have even converted a few fishermen and hunters! The weather, always a factor at contests, caused some early concern; the most frequently heard comment was "I sure hope it cools off a little!" It didn't!

51
OF THE COUNTRY'S TOP SCALE BUILDER/FLIERS CONVENED FOR THE "SHOWDOWN"

The Thursday evening pilots' meeting was presided over by scale ace Kent Walters, who used the gathering as an opportunity to clarify any misinterpretations of the rules. Suffice it to say that a considerable number of changes are in store for the Scale Masters '93 program, so those of you who are contemplating participating would do well to become familiar with the revisions. For example, flaps and retracts are *not* scored as individual options; they are demonstrated to the *flight* judges during the preflight briefing and are scored *only* as part of the Flight Realism score. No freebies here, guys!

A JMP F-4 Phantom kit was the starting point for Scott Foster's variation of a Blue Angel F-4J. Powered by a pair of O.S. .65 fan engines driving Dynamaxes, the model displayed remarkably scale-like performance. The crowd loved the functional drag chute!

The desert camouflage scheme on Dave Sawatzky's Beech T-34C Turbo Mentor was attractive, and a pleasant change from the more regularly seen Navy livery. Operating brakes and navigation lights.

AN IMPRESSIVE ASSEMBLAGE

Out at the contest site, after everyone had set up their tents, shelters and work areas, it became obvious that we were, in fact, looking at some of the finest R/C scale models anywhere. Many of them looked as if they belonged in museum displays; most of them looked as if the owners should seek counseling for even considering risking them by flying! But flying them was half the battle, so you knew you could depend on seeing each of them airborne—at least once!

Take, for example, the F-86 Sabre built and flown by Shailesh Patel. Not only did it receive the top Static score of the meet (98.0), it was also the recipient of the Best Military model award. Close inspection revealed some of the reasons why; the gun-bay panels on the left side could be removed to expose not only three perfect .50-caliber machine guns, but also the ammo rounds and boxes! The markings could only be called superb, and his static score was well-deserved. Mechanical difficulties prevented Shailesh from carding the flight scores he needed, but he still finished a very respectable 16th.

Second-place finisher (both overall and in Static) Charlie Nelson campaigned his now-famous YKS Waco Cabin biplane for what could be its last time. Charlie has a new one nearly finished; it's a little larger, but I don't know how it can be any better.

THIS SURE AIN'T THE THRILL OF VICTORY

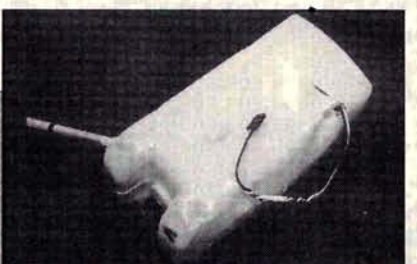
I have covered the Scale Masters championships for the past few years, and you've probably seen that coverage on these pages. My preference in R/C had always leaned towards scale and I, like many other modelers, had often wondered what the competition was really like—what it felt like to compete in the Scale Masters. With past coverage, I could only try to convey the feeling by talking with the competitors, listening in on their conversations and observing the proceedings. At the end of last year's coverage, I suggested that you readers not only attend the meet, but participate. Qualify at one of the regional meets and fly in the Masters. I took my own advice. This time around, I put a new spin on the assignment; I'd enter and experience it all, firsthand.

My SNJ was ready, everything was working correctly, and I was as prepared as I was ever going to be. For the first time, I would compete against guys like Terry Nitsch, Diego Lopez, Gene Barton, Charlie Nelson and 46 other top scale contenders. Was I nervous? Nah! Even with the rubber isolation mounts on my transmitter, the antenna always looked like a blur! Everyone told me that after the first round the jitters would subside and be replaced by sheer terror! My last maneuver on that first round was a perfect "off-field" landing. I could have sworn I had called it, but the judges said, "No," and suggested that I try the runway for subsequent landings.

I did calm down, however, thanks to words of confidence from guys like Denny DeWeese, who said, "We'll all stand down Rich; it's *fun* to watch you fly!" and Gene Barton, who offered, "If you're going to keep landing like that, old buddy, you really should put a set of *my* retracts in there. They'll take the abuse!" Real tranquilizers, these guys!

Calm and composed, I was on my final round with a good flight going when the big Texan rolled left to the vertical and proceeded to bury itself in the not-so-forgiving Texas countryside. Wasn't much left; G-62 destroyed, airframe in a ball, retracts mangled. Are we having fun yet? My best guess for the cause of the crash was battery failure. It's one of those problems that you can't anticipate, only practice preventive maintenance to stack the odds on your side. Like I said: when it's time, it's time!

So, did this minor setback dampen my enthusiasm? Were the uncountable hours expended on building the Texan wasted? Am I getting out of the hobby? No way! Was competing in the Scale Masters with some of the finest guys around worth it? Way—absolutely way!



Now this is an R/C tank! The crash impact of my SNJ drove the throttle servo and a 3/16-inch dowel through the wall of a 32-ounce tank. Lots of energy dissipated quickly.

Charlie flies the Waco like a sport model, and he knows it well, flies it smoothly and finishes consistently. Less than .6 of a point kept him from repeating his 1st-place Top Gun '92 finish here at the masters!

Below: one of two Globe Swifts at the meet. This 90-inch-span, S.T. 3000-powered Swift by Jerry Mong had an absolutely gorgeous finish and flew well; 5th place in static with a 95; 21st overall.

Above: Scott Foster does some last-minute maintenance on the big F-4J Phantom between flights. Two O.S. .65s driving Dynmax fans provide the power.

MOVE OVER, OLD GUARD?

Seventeen of the top 20 finishers could be considered seasoned contest veterans with significant competition experience behind them. Most of their models have been around a while and continue to benefit from fine tuning and tweaking, but they also provide the benefit of familiarity that comes from practice. The remaining three top 20 finishers, however, were among the youngest in the competition; their airplanes were new and their performances outstanding. Tom Polapink flew his Albatros DVa to 8th place overall, and he took home the CD's Choice award.

Another newcomer was Clark Hopkins, flying a ⅓-scale Extra 300 finished exquisitely in the Spanish Aerobatic Demo Team colors. Clark ended up in lucky 13th place. Rounding out the youth movement was Nick Ziroli Jr. who finished 18th with his F4U-1 Corsair. It must be a genetic thing, because Nick Jr., like his well-known dad, is a "hot stick" and, with a little more experience, will probably equal or better Sr.'s contest record.

I'm proud of both Tom and Nick because we're members of the same club and fly together often. It's great to see some of that elusive "new blood" competing at top levels!

Gene Barton works on the business end of his T-6 while Diego Lopez tends to the restraining chores—not easy with a 4.2 Sachs pulling in the other direction!

Heavy congestion in the pits! Jeff Foley slides his Zero past Garry Dennison, who rolls Eduardo Estavez's Rearwin out of the staging area while Eduardo signs an autograph!

THE GROUND JUMPED UP AND SMOTE IT?

It has been said that when time is up, it's up, and nothing you can do can change the inevitable. So seemed to be the case with a fair number of the models at this competition. It's hard to blame "pilot error"; although it does happen, it's infrequent at this level of competition. Regardless of the reason, there are a few models that you probably won't see on the circuit anymore! Among them, Mel Whitley's Top Gun-winning Hawker Sea Fury with the incredible engine sound, Gerry Fingler's colorful Cessna Bird Dog, whose wing decided to give up, Tommy Weemes' beautifully film-covered aluminum Curtiss Hawk 75, Nick Tusa's gigantic Fokker D-VII and my very own SNJ-5C Texan.

It's hard to estimate the number of hours that these lost models consumed, but it serves as a reminder that once there's light under the tires, anything can happen. That possibility should only heighten the challenge, not deter you from trying again. I'll just bet that the guys who lost their airplanes already have new ones under way and that you'll be seeing them soon, perhaps even at the upcoming Top Gun. Me? I started on my new Texan on September 2. (I took a day off after the competition to rest and let my wife console me!)

TOUGH-FOUGHT AIR BATTLES

As the flying rounds progressed, no clear winner was emerging.

SCALE MASTERS '92 WINNERS

SPECIAL AWARDS		
Pilots' Choice	Dick Hansen	Albatros DVa
High Static	Shailesh Patel	F-86 Sabre
Best Military	Shailesh Patel	F-86 Sabre
Best Civilian	Charlie Nelson	Waco YKS
CD's Choice	Tom Polapink	Albatros DVa
Best Scratch-built	Charlie Nelson	Waco YKS
Best Plan-built	Ed Newman	Fieseler Storch
Best Built-up kit (three-way tie)	Harold Hester	Spacewalker II
	Bruce Tharpe	Spacewalker
	Jeff Foley	A6M2 Zero
"Grey Eagle" Perpetual Trophy	Chuck Fuller	SuperStearman

TOP 10

POS.	PILOT	AIRCRAFT	SCORE
1	Terry Nitsch	F-86 Sabre	184.58
2	Charlie Nelson	Waco YKS	183.83
3	Kent Nogy	F-86 Sabre	182.91
4	Diego Lopez	A-1E Skyraider	181.83
5	Bruce Tharpe	Spacewalker	181.08
6	Jeff Foley	A6M2 Zero	180.58
7	Gene Barton	T-6D Texan	179.91
8	Tom Polapink	Albatros DVa	178.66
9	Gene Job	A6M5 Zero	178.33
10	Don Hatch	Canadair CL-215	177.50

Top finishers in this year's competition; winner Terry Nitsch is at far left. Great prizes included trophies, radios and kits provided by Pacer Technology and others.

Canadian Don Hatch placed 10th with his Canadair CL-215 Water Bomber and took the time to explain its Wankel engines and water-drop capability to spectators.

The nature of the competition made it impossible to tell who, if anyone, had an advantage. It was quite possible to fly a good round then blow a couple of maneuvers in the next round and lose five places. It didn't seem to matter which *type* of model was entered, either. Jets, biplanes, twins, fighters, trainers, amphibs, general aviation; they were all represented, and any one of them could have won.

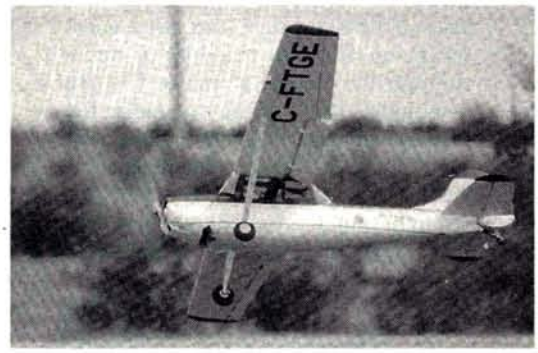
Proving that not all warbirds need be of the "heavy metal" variety to score well and be impressive, Ed Newman's Fieseler Storch received a static score of 93.5. Based on the old Swenson kit plans.

Watching the competition unfold, you couldn't help but develop some "favorites." Since I had seen many of the entries before, I focused on the previously unseen models, like Jerry Mong's scratch-built Custom Globe Swift. I had seen and photographed the full-size version two years ago at Oshkosh. I photographed it because I thought then that it would make a great model. Apparently, so did Jerry. He did a terrific job on his 90-inch, ST3000-powered version. A little more practice with the airplane and Jerry will be a serious threat in any competition. He scored a 95 in Static.

Proving that not all warbirds need be fire-breathing fighters, the Stinson L-5 Sentinel designed, built and flown by Roy Vaillancourt flew as gently as a Cub. For his flight routine, Roy selected maneuvers that demonstrated the unique STOL capabilities of the nicely finished "L"-bird. There's unquestionably a lot of talent in the scale modeling fraternity; much of it was displayed at this meet.

THE TENSION MOUNTS

The two rounds flown Saturday grouped the contenders even more closely. The pressure was on, the temperature was up, and the wind was starting to blow. First-round "jitters" were memories, and every effort now had to be made to make every flight as good as it could be. At the end of the day, no front-runner was apparent, but the leading contenders were emerging, so everyone settled back for an "unwind" session at the banquet dinner. This provided the opportunity for all those involved with the event—participants, officials, sponsors, wives, girlfriends and others—to socialize, exchange notes, strategize and "party on, dude!" Strictly from an observer's perspective, everyone appeared to have a great time. It was announced that Sunday's flying would be delayed until 9 a.m.—no reason given, but lots of applause!



Crosswinds made for some tricky arrivals. Here, Gerry Fingler's L-19 shows its Canadian registration number. The model later wiped out when the wing failed.

THE FINAL COUNTDOWN

With the scores to this point posted, all the fliers knew where they stood and what it would take to go home with some hardware. A few lucky breaks, some unlucky occurrences and a lot of outstanding flying eventually told the story. After all the electronic score tallying had taken place, the ace from Ohio, Terry Nitsch, had topped the field, posting a 184.58 final score, scant fractions in front of Charlie Nelson. A jet and a rag-covered biplane! Talk about diversity of subjects! But that, as I've tried to point out, is the very essence of the Scale Masters. You build and compete with what you want; if it's good enough, you can win all the marbles!

SO, WHAT'S IT TAKE?

Kit-built airplanes represented more than half the entries, pointing out that you don't have to scratch-build to be competitive. In fact, only one of the top five finishers was completely scratch-built—Charlie Nelson's Waco. Two F-86 Sabres, Terry Nitsch's and Kent Nogy's, finished 1st and 3rd, respectively. Both were built from BVM kits.

So, what are the *other* ingredients, since *you* can buy and build these kits? Perseverance and practice. Any of the competitors will tell you that. The guys who have been at it the longest and perform the most consistently are the guys who usually win. They practice. As for those newcomers, it's great to see them, but they *already* know that they'll have to persevere!

The continuing success of the Scale Masters program is a result of its organization. The credit for all of this goes to Harris Lee for his ability to recognize the need, convince sponsors of the value and obtain the resources necessary to conduct the program in the professional manner we've come to know and enjoy. As I said, scale modelers love scale models, sport modelers love scale models and non-modeling spectators love scale models! Everyone benefits! ■

SIMPLE PROGRAMMING

DAVID C. BARON

ARISTO-CRAFT VALIANT 8

RADIOS WITH THE ability to select frequency are not new. About 10 years ago, Kraft came out with a system with this capability, but it scanned fewer channels and the tolerances it had to meet were easier owing to the old, wider frequency separation between those channels. Lately, other manufacturers have been hinting that they are developing a similar capability, but only—as far as I am aware—for radios that cost at least twice as much as this one. With the Valiant, Aristo-Craft* has beaten the others to the marketplace, and with a price that will give the competition a big headache.

Every time that you turn on your radio to fly, you must connect a jumper cable that runs between the transmitter and receiver. This is required, because it's the only way in which the transmitter and receiver can be made capable of locking onto the same channel. It certainly wouldn't be acceptable for the transmitter to be putting out a signal while it's scanning, and the jumper cable prevents this. When your radio is turned on and connected, the scanner checks the channel that you last used and will either blink, buzz and show the amount of interference, or lay in wait silently, if it's safe to fly. To fly, you must disconnect the jumper.

Aristo-Craft's new channel scanning and synthesizing radio, the Valiant 8.

At this point, your radio will start to transmit.

If you wish to scan the channels, leave the jumper connected. To check the next channel, move the right stick of the transmitter up or down to go up or down through the channels. While you are "stepping" through the channels, the Valiant will give you both audible and visual warnings if there is interference on the channel you have selected. The field-strength meter signal shows just how much power is behind this interference. (The battery-strength meter doubles as a field strength meter.)

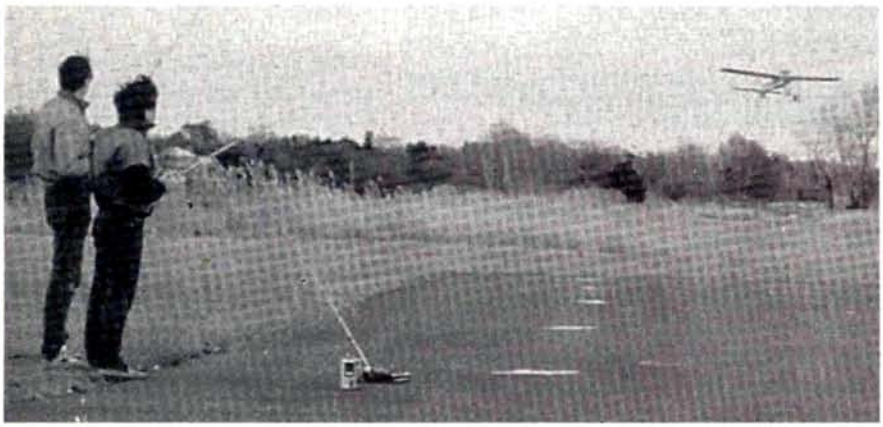
To get an idea of the efficiency of the meter, I tested it by placing a transmitter at given distances from the Valiant 8. I found that most radios with their antennas extended gave a full deflection of the meter up to 150 feet from the Valiant 8. Beyond this, the strength of the signal varied, yet it left me confident that anything close enough to interfere with my radio would be detected.

Using this radio as a scanner in a transmitter impound would probably prove invaluable, and I would imagine that many larger clubs may consider buying these radios for that purpose, as well as to establish which frequencies are subject to interference at their flying site. I experimented with this function at several local club fields and found the radio's ability to detect interference and give a strength value for that interference to be invaluable.

Given all it does, the receiver is remarkably small and compact.

A "phase-lock loop circuit" for frequency synthesis allows the user to choose from any of the channels to fly. This circuit, in effect, replaces the need for individual crystals for each frequency. This can translate to savings, if you have a need for multiple channels.

The ability to synthesize channels could cure problems at flying sites all around the world. At a crowded field, it



Senior editor Chris Chianelli flies a sport plane controlled by the Valiant 8 while columnist Dave Baron flies another plane nearby. Two other transmitters, turned on, sit on the runway nearby.

SPECIFICATIONS

Manufacturer: Aristo-Craft
Model: Valiant 8
Sug. retail price: $419.95
Mode: PCM
No. of channels: 8
No. of model memories: 1
Programmable mixes: 3

Features: the Valiant* offers simple, fail-safe implementation: two transmitter power settings: low-airborne-battery warning system: adjustable travel volume: dual rates: and servo-reversing, etc.

Notable and new: this radio smashes a lot of barriers. At a time when radios with a wide array of bells and whistles are selling for prices higher than our airplanes can fly, this radio provides a combination of features that, when compared with those of the rest of the market, should cost over a $1,000, yet doesn't.

Radios offering the ability to select frequency are not new. About 10 years ago, Kraft offered such a system, but it scanned fewer channels and used the older wide-band channels. Lately, other manufacturers have promised a similar frequency-synthesizing capability on their high-end models. These radios are likely to cost twice as much as the Valiant 8.

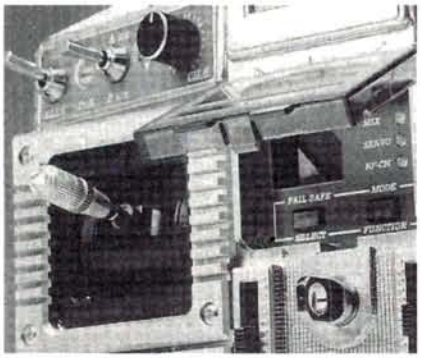
Hits
• Frequency scanning and synthesizing • Price • Simple programmability

Misses
• Beeping when mixing is in use can't be suppressed.

often occurs that six pilots out of the 20 present are on the same channel. Guess who is always one of the six? Sound familiar? On the other hand, I can imagine two possible drawbacks: one is all of the frequency flags you may have to make! The other is you may run out of fuel before you run out of daylight!

TWO POWER MODES

The transmitter has two power-output positions: "stand-by" and "normal on." In the "normal on" position, the transmitter output is a full 600MW. In the "stand-by" position, the transmitter output is 20MW. This is especially sensible for working on the workbench. I can't remember how many times the transmitter batteries have died while I was installing radio equipment in a model and was too distracted to notice whether my transmitter was turned on or off. Transmitter battery life in the stand-by mode appears to be eight hours.



The digital LED display and two-button control board are under the transparent hatch on the front of the transmitter. The open hatch will also protect the gimbals if the transmitter falls forward.

PROGRAM THE TX

The Valiant has three mixes that can be used between any of the eight channels. These mixes are established by using the simple two-button keyboard on the face of the transmitter. First, you establish which channel will be the master and which channel will be slave. Next, you establish how much throw will be allowed on the slave channel. There is a coarse adjustment choice of two ranges of throw and a secondary fine adjustment within each of these two ranges. Last, you choose the polarity of the slave channel (in case it's going in the wrong direction when you move the master channel's control stick, switch, or knob.)

FAIL-SAFE

This radio's fail-safe is simpler to set than that of any radio I have tested. To program it, all you do is hold the sticks of the radio in the position that you want them to be in when the fail-safe has kicked in and then depress the fail-safe button (which is under the panel on the face of the transmitter). When you hear a chirp from the radio's internal beeper, the fail-safe is set. Test this by turning on another transmitter on your frequency, or by just turning off your transmitter.

REVERSING AND ATV

The reversing and travel volumes are set up at the same time. It's done by pressing the appropriate button under the cover on the face of the transmitter. You are then able to use the right stick of the radio to scroll through the channels. This is done by moving the stick to the left until the display shows the channel you wish to reverse and then moving the stick up and down to establish either normal or reverse for that channel. Moving the stick to the right will display a 0 in the digital read-out. This represents 100-percent throw; moving the stick down will display numbers from 9 down to 5. This represents 90 percent through 50 percent of throw. You simply stop at the amount of throw that you wish to have. This will give you that much reduction of throw in both directions of control movement.

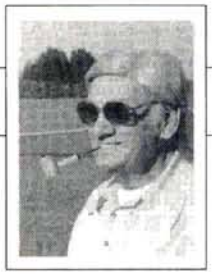
DUAL RATES

This function uses the simple system of a mechanical potentiometer "slaved" to a switch. The system provides two different rates (high and low), depending on switch position. The only drawback to this system is that there seems to be some interaction with programming the basic mix functions. You must be sure that the dual rate switches are in the "on" position, or you will not be able to accomplish programming.

This radio is, indeed, worth its price. I believe it will remind other manufacturers that if we buyers think that we are being overcharged for the features we all want, then manufacturers like Aristo-Craft will produce more for less and we will buy it. I feel that the single most valuable feature of this radio is its ability to scan through the channels and look for interference.

**Here's the address of the company featured in this article:*
Aristo-Craft/Polks Model Craft Hobbies, *346 Bergen Ave., Jersey City, NJ 07304.* ■

GOLDEN AGE OF R/C



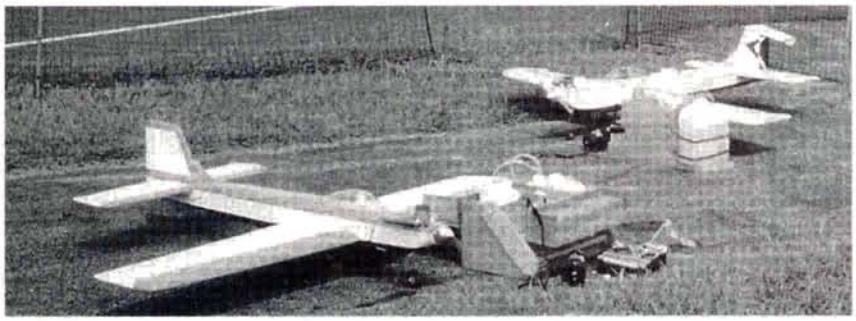
HAL DeBOLT

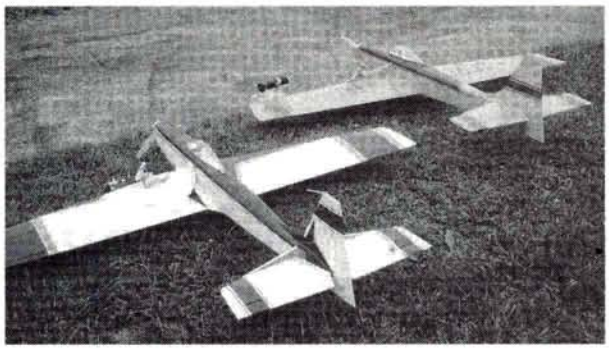
OT NETWORK—ALIVE AND WELL

WE HAVE some catching up to do after all the attention we gave to world records. If the requests we get for sources for OT R/C model plans is any indication, there are many newcomers to OT action. For new people (and many veterans, too!) such sources are well hidden. So, once more, we'll include some helpful addresses at the end of this column. The Vintage R/C Society* should have a complete listing. If you want something, give them a try.

Mickey also says that the SPA Masters event in Smyrna, GA, was very successful, and as soon as they wrap up all the details, we'll have a report.

The Knoxville, TN, meet was held at a beautiful, first-class facility in the mountains. CD Dennis Hunt and his club conducted the event in championship style. The winner in the Novice Class was Phil Spelt and in the Master Class, Ed Hartley. The most popular designs were the New Orleanen and Jim Whitley's Daddy Rabbit. There were many fine pattern designs that may be compared favorably with modern stuff.





Above: two Jim Whitley-designed Daddy Rabbits on the flight line at the Knoxville SPA meet. The one on the left is by Ed Hartley, and the one on the right is by Jim Jones. Right: these modern-looking, pre-1970 designs were seen at the Knoxville SPA meet. The New Orleanen (right) is by Mickey Walker, and the one on the left is by Curtis Motes.

LOOKING BACK AT '92

Mickey Walker, the Senior Pattern Association's (SPA) "main man" says that many clubs held events that inspired new interest among their members and provided new ways to compete. The SPA is two years old. It grew in a small area, and it doesn't have any national affiliation, so it depends on your support. It's worth it!

Mickey and other club members attended three scheduled meets that went off without a hitch. The events drew many previously dormant OT pattern people who regained their enthusiasm; they were chomping at the bit to get started. It does take time to get a grassroots organization into high gear!

Ron Van Putte will report on the Ft. Walton Beach, FL, meet in detail soon.

R/C DETECTIVES

You people have a penchant for contacting past R/C "names" that often rivals private-detective action. From Max Chernoff of Tampa, FL, through Tom McCoy of Sun City, FL, comes an address for John Zaic*. John and Frank Zaic were chief honchos of "Jasco," and John went on to produce Aero R/C kits in the '50s. (Arthur Miller of Dunnellon, FL, is enjoying an Aero 7 built from an original kit—his second. He now has a goal of producing a "9" and a "15" to complete the fleet!)

Colin McKinley's electric-powered version of the LW Senior at the KRC Electric Fly and a full-scale version of Goldberg's magnificent Valkyrie. It's hard to tell electric models from gas models these days. (Note the background models.)

Another "detective"—Colin McKinley of Winston-Salem, NC—wanted to add an LW Senior to his stable, but he was unable to find plans. He figured that a Senior was probably nothing more than an enlarged Trainer, so he enlarged the Trainer's wingspan to 69 inches (the original was 65 inches). Some of you go to amazing extremes to make a plane you *really* want! The Senior was actually the first LW design. The smaller Trainer was the second design and the first kit; it was developed because the manufacturers of the Senior thought that modelers wouldn't pay $14.95 for an R/C kit! With the Trainer's immediate success, a short run of the original LW Senior was produced. When sales proved it popular, the Senior was "dolled up" and offered as the LW Cruiser. Confusing? Yes, but that's the way things evolve in this industry!

Colin's version of the Senior is electric-powered. He uses an Astro 25 with 12, 1800mAh cells. He says that, at 7 pounds (it originally weighed less than 5 pounds), it flies as old rudder-onlys did: it takes off easily and cruises or glides at

about the same speed. Colin demonstrated his Senior at Selinsgrove and at the KRC Electric Fly; everyone thought it was very realistic. If there's a demand, he may produce some kits of his version. His Senior was one of more than 25 LW designs flown at Selinsgrove last year. They must have had a great meeting!

A couple of years ago, LW enthusiast Bill Weaver* faithfully traced the original Senior plans, and he's still offering copies to those who want them.

Carl Carson of Mount Airy, NC, tells us about his first R/C—an LW Champ—that he built while he was in the service at Kami Seya, Japan. He used a K&B .19 and a Babcock radio. Carl ran across the old plans recently, and he couldn't resist building another. This time, he powered it with an O.S. 25, and it uses an OT Logictrol Super Pro radio. It raises eyebrows every time it flies!

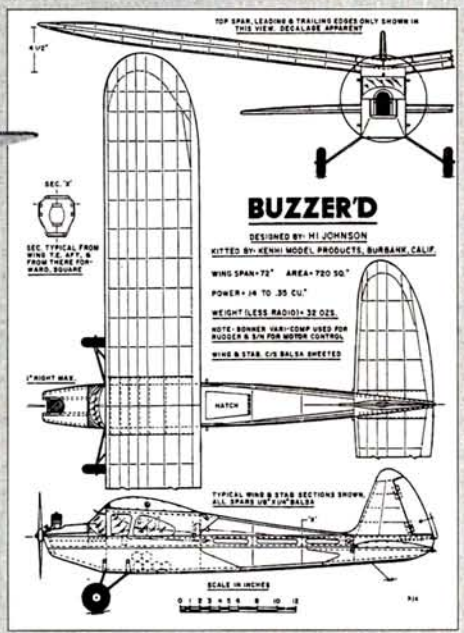
Above: Carl Carson's replica of his '50s-era LW Champ. Note the authenticity with deBolt's AMA number and the OT Logictrol Super Pro TX. Right: Carl Carson's V-K Cherokee (powered by a Kraft .61). Years ago, he built and flew his first Cherokee while stationed on Guam.

In 1965, while stationed in Guam, Carl built a V-K Cherokee. For years, he has been searching for another set of plans. He finally found them at De Ja Flew in Clovis, NM. He quickly went to work, and now he's flying his second Cherokee powered by a Kraft 61. Carl is happy with the combo and its performances. Proctor Enterprises* now produces Cherokee kits for anyone who's interested.

THE BUZZER'D

In June '92, a reader wrote looking for Ken-Hi Buzzer'd plans. This brought a reply from Alvin Johnson of Oxford, PA, who offered to copy his original kit plans. Also, *Model Airplane News's* Joe Wagner was deeply involved with Veco and Ken-Hi at various times, and he gave us a gold mine of information.

The Buzzer'd was a pretty design—at least, on paper. It still has followers, even though the designer/manufacturer, Hi Johnson, said that only 250 kits were produced in 1952.



A three-view of the elusive Hi Johnson-designed Ken-Hi Buzzer'd—a 6-foot span for single-channel .19 to .35 engines. (Drawing courtesy of D.B. Mathews.)

Gil Henry, a businessman with no modeling expertise, headed Veco, a major company in postwar modeling. For design and manufacturing know-how, Gil depended on area modelers who were eager for model-oriented work. He wasn't an easy man to work with, and the list of famous modelers who tried is long: Joe Wagner, Bob Palmer, Hi Johnson, Mel Anderson, Clarence Lee, Dale Arnold. What a lot of talent! Veco was slow to leave C/L when R/C arrived, but it did offer a few R/C kits. The company made its mark—especially in C/L—with some fine engines.

When Hi Johnson left Veco, he formed a partnership with Ken Adams (of Atwood and Adams) as Ken-Hi Model Products. They produced a line of C/L kits that paralleled the Veco offerings. With the diminishing C/L market, there wasn't a strong enough demand to support two similar lines of kits. The Buzzer'd was their attempt to enter the R/C market, but it was too little, too late.

ANY INFO ON...?

Mentioning V-K (Vern Krehbiel) brings back memories. When I moved to Buffalo before WW II, I checked out local model activity. Vern was an active member of the Buffalo Aeronauts, and we got acquainted over a Sunday dinner at his mother's house. Vern and I grew up with modeling and, after the war, we both ended up in the model business. Dmeco was already established with C/L when R/C came along. Vern established V-K to produce R/C kits; I think his first was the Challenger. Does anyone remember it? I don't have any more information about V-K. They did some great things. Does anyone else have any information?

There's more, but space is gone again. Remember this is *your* OT R/C place!

**Here are the addresses that are pertinent to this article:*
Vintage R/C Society, *4326 Andes Dr., Fairfax, VA 22030.*
John Zaic, *2005 Palmetto St., Ridgewood, NY 11385.*
Bill Weaver, *P.O. Box 373, Middletown, MD 21769)*
Proctor Enterprises, *25450 NE Eilers Rd., Aurora, OR 91002.*

Additional sources:
Fran Ptaszkiewicz *(Dmeco C/L and LW plans), 23 Marlee Dr., Tonawanda, NY 14150.*
Tom Dixon *(OT C/L and R/C plans), P.O. Box 671166, Marietta, GA 30066.* ■

DOUGLAS F4D-1 S

SPECIFICATIONS
Scale: 1/7
Wingspan: 57.5 inches
Length: 77.5 inches
Weight: 18 to 21 pounds
Power: Dynamax fan; O.S. .91 engine

Designer Mark Frankel poses with the F4D-1.

Based on data captured from the Germans after WW II, the Skyray was intended to be a high thrust-to-weight-ratio aircraft with a low drag profile that would climb like "a bat outta hell." Numerous problems with the original powerplant (Westinghouse J40) and some unanticipated nastiness in the handling qualities resulted in extensive delays in reaching operational status. The result was that the Skyray, which was designed as a second-generation jet, reached front-line service with third-generation aircraft such as the Chance Vought F8U Crusader. Nevertheless, the Skyray's radical design resulted

SKYRAY

MODEL AIRPLANE CONSTRUCTION NEWS MAGAZINE

IKE WAS IN the White House; the Phillies were tearing up the National League; the Russkies were menacing North America with long-range bomber exercises and the Navy was looking for a high-performance interceptor to guard the Free World. In this environment, Ed Heinemann's design team at Douglas was preparing a radical tail-less aircraft for front-line carrier service. The F4D-1 Skyray (or "Ford" as it was nick-named by the naval aviators of the day who discovered that F4D repeated after three rounds at the Officer's Club sounds just like the automobile) was remarkable in many respects, but it was also disappointing.

by MARK A. FRANKEL

A Navy Hot Rod From The Golden Age

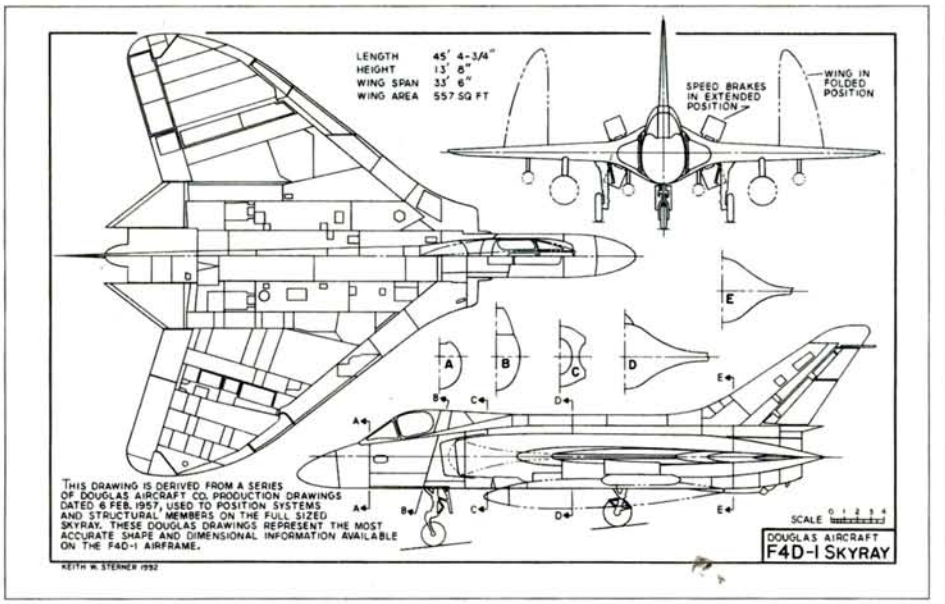
in performance that allowed it to capture several world records. On the 3rd of October, 1953, Lt. Cmdr. James Verdin piloted the number-two prototype Skyray to an absolute speed record of 752.78mph, and in 1958, the Skyray set several Time-To-Climb records.

Few naval aviators will criticize the Skyray's esthetic appeal, but many pilot recollections are downright scathing when it comes to flight characteristics. Captain Gerald G. O'Rourke wrote one of the most entertaining accounts in the June 1986 issue of *Proceedings*: "The F4D Ford: A Better Idea." (A similar article from Capt. O'Rourke appeared in the summer 1979 issue of the *American Aviation Historical Society Journal*: "The Douglas Navy F4D Ford.") Some of Capt. O'Rourke's milder comments include, "The Ford, as it was immediately dubbed by fleet pilots, turned out to be a pretty bad airplane, all things considered...Night and all-weather capabilities imply lots of instrument flying for which good flight stability characteristics are needed. The F4D had almost none...The airplane was just as happy flying on its side as it was flying upright. The afterburner lit with a bang that curdled your buttocks...."

Discussing the Skyray's transonic ability, Capt. O'Rourke pointed out that the airframe was originally designed for a relatively low-powered engine but that the production aircraft received the energetic J-57: "...the effect (of the J-57) was devastating. The plane could, and often did, get into this speed regime, where it reacted like a sledgehammer against a sheet-metal building. It would fly supersonically, and not too comfortably, once it got through the transonic region, but you had quite a ride and usually downhill to get there."

O'Rourke's observations were answered in the February 1987 issue of *Proceedings* by the Skyray's designer, Ed Heinemann, who reminded the retired Captain that the Skyray was a pioneer design born in the mid 1940s, and that if the Navy had developed the Skyray's follow-on design, the F5D Skylancer, a truly refined aircraft would have emerged.

This good plane/bad-plane debate appears throughout much that has been written about the Skyray, but one fact is clear: the F4D absolutely oozes with the character necessary for a good scale subject. I was not the first to discover the Skyray's suitability for modeling. Dave Platt, the notorious Dave Platt, designed



F4D-1 SKYRAY

and built a "Ford" for the AMA National during the mid-1970s. As it turns out, Platt became the first National contestant to enter a ducted-fan model in Radio Control Scale. I still hear recollections of the legendary flight when his Skyray, flying in a heavy overcast, entered a cloud base during the loop. The model disappeared for several seconds, then reappeared on the exact heading and altitude for a perfect maneuver. Some say, however, Platt actually bent the transmitter stick during the pull-out.

I chose to model the Skyray in 1/7-scale to provide an airframe large enough to carry extensive detail and operate from grass fields. While designing the model, I was contacted by a modeler from St. Louis, Mark Nankivil, whose father had been a "Ford Driver" in the Navy. Having collected F4D memorabilia since childhood, Mark became my most valuable source of Skyray lore. He provided me with a set of structure drawings used during the Skyray's production run that contain the most dimensionally accurate information available on the airframe shape. These drawings became the basis for my fiberglass tooling.

Initially, I built two basic examples to act as proof-of-concept models. I needed to verify a multitude of decisions concerning the center of gravity location; control deflections; radio placement; fuel system layout and powerplant installation. After gaining some experience with these models, I flew them at various ducted-fan events. The "Ford" won trophies at Rome, NY, and Fort Worth, TX, so it was apparent that the Skyray was a viable scale subject. I started a third airframe to carry cockpit detail, functioning gear doors, underwing stores and a detailed finish in the markings of a VFAW-3 aircraft that was flown by Mark Nankivil's dad.

CONSTRUCTION NOTES

If you choose to build the Skyray, you will need a modern radio with mixing capability and at least seven channels; a Dynamax ducted fan with an O.S. .91 (or equivalent) engine and tuned pipe, a specialized retract system that is based on the Dave Platt Models Competition Retract System, and various fiberglass, foam and vacuum formed components that are available on a custom order basis from Model Specialities, 1220 Sylvan Rd., West Chester, PA 19382; (215) 692-4139. A VHS video is also available from Model Specialities.

The plans that accompany this article (two plans sheets are shown, but three sheets are provided) include a detailed construction manual with photographs and an accurate three-view drawing that can be used for scale competition.

As a brief overview, the fuselage structure consists of nine bulkheads that are cut from either 1/8-inch poplar (lite) plywood or 1/8-inch birch (aircraft-grade) plywood.

The propulsion system consists of a molded fiberglass inlet duct, the ducted fan and a molded fiberglass tail pipe. The ducted fan is serviced, and most of the structure is installed, through a large fuselage hatch. Engine starting is accomplished by removing the canopy assembly to provide access to the

FROM THE COCKPIT

by PHILLIP F. OESTRICHER

When my good friend Mark Frankel asked me to write a few words about the Skyray, it brought back a flood of memories. My first contact with the F4D was in 1957 after flying the F9F-8 Cougar for a year at MCAS Cherry Point, NC. The F4D was a most exciting new airplane for the old hands as well as junior aviators like me. There it was—a futuristic shape, no horizontal tail, big J57 engine, *afterburner (!)*, strange control stick, radar, etc.—a most interesting and exciting package.

Phil Oestricher sits in the cockpit of his Skyray.

If just looking at it was exciting, flying it was almost beyond description. The takeoff acceleration, weird gear retraction (it yawed noticeably as the starboard main door opened first and closed last) and climb rate sure got my attention. It had excellent turning performance and handled reasonably until reaching about 0.9 Mach, where strange pitch trim changes appeared. It was a pleasure in the traffic pattern. Nothing looked better than a four plane fan break of Fords without external tanks! It was a great step forward at the time, but performance had its price and the F4D sometimes bit back in a deadly fashion—I lost six friends to it.

Mark's model is interesting to me because of my association with the F4D and the fact that the airplane has been somewhat ignored by historians and modelers. His selection of scale and power is excellent and has resulted in a model that accurately represents the Skyray. His model is extremely realistic as it rotates on takeoff, climbs away, turns and passes by. The model rolls a bit more crisply than the big one did, but nicely captures the slight, undamped Dutch Roll oscillation during the final portion of the approach. The pitch attitude of the model is very close to that of the full-scale Skyray. The J57 was a mild smoker (when not in afterburner), so Mark's well-lubricated engine leaves a realistic trail. He did a super job of recreating the impressions of flight of a specific type—just what flying scale modeling is all about!

fan with a starter probe.

The wings and vertical tail are 1/16-inch balsa sheeting over foam. The wing loads are carried by blade spars that are attached to bulkhead F7.

The landing gear units are being prepared for Skyray use by Dave Platt Models.

The landing gear door system is the most complex feature of the model. My first two Skyrays were flown with no gear doors; however, a significant performance improvement from the doors was apparent on my third Skyray. Each wheel well is covered by two doors, a forward and aft door. The aft door remains open when the gear is extended—it's closed only when the gear is retracted. The forward doors cycle. They are closed when the gear is extended, they open to permit retraction and they close again when the landing gear is in the well.

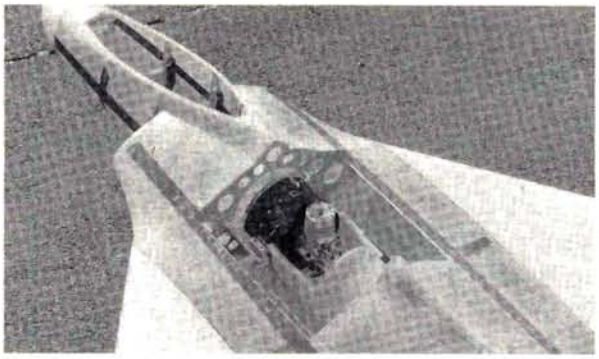
My initial solution worked as follows:

a) Each door (with the exception of the nose-gear aft door) is actuated by a miniservo such as the Futaba FP-133.

b) The aft main-gear doors are connected to the retract channel. When a retract command is given, both the retract servo and the aft door servos are activated. However, to prevent the doors from closing too quickly and fouling on the landing gear struts, a microswitch is placed in a "Y" harness that connects the door servos. This switch prevents current from reaching the door servos until the landing gear is retracted into the well. The switch is positioned so that one of the retracted struts closes it, allowing current to flow. The nose-gear aft door is tied to the nose-gear strut with a pushrod and is simply driven by the movement of the nose gear.

c) The forward, or cycling, doors were initially actuated by a separate channel so that the landing-gear sequence at the transmitter required the pilot the open the doors, retract the gear, and close the doors. In theory, and on the ground, this system worked well. Even on the first few test flights it looked good. But in the heat of competition, it became my worst nightmare. The pilot workload was overwhelming with all the other demands of flying the airplane.

A specialized system was developed by a retired IBM engineer, Tony Criscimagna of 2 White Ln., Woodstock, NY 12498; (914) 679-8549. In his system, the position of the landing gear tells the door servos how to behave. The first gear to unlock signals all three doors to open, and the last gear to retract signals all doors to close. The same occurs on landing gear extension.

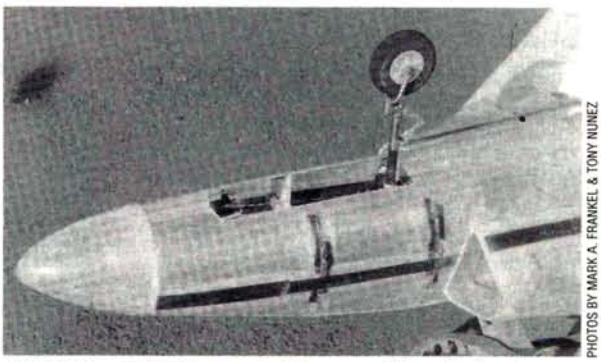


Dynamax ducted fan and O.S. .91 fan engine can be seen in the F4D-1 airframe. Note bulkhead.

FINISH AND MARKINGS

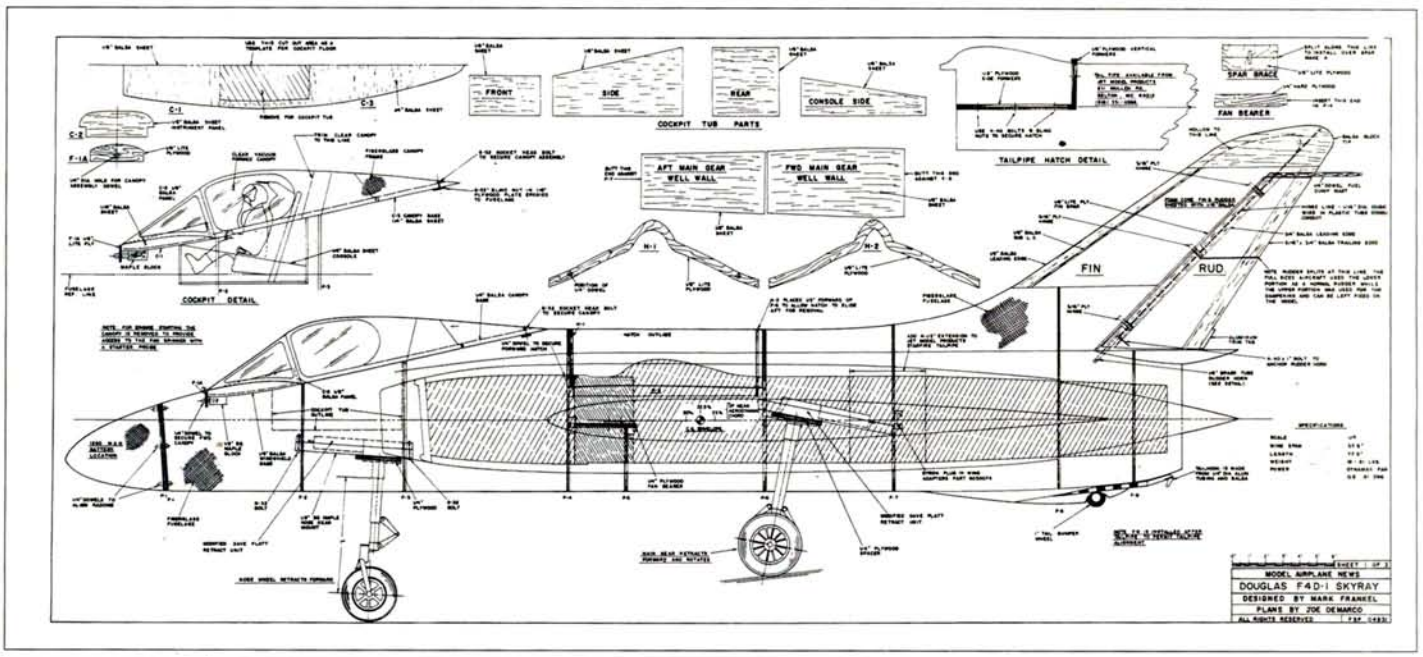
The Skyray probably wore more diverse color schemes than any aircraft in the Navy's inventory. The prototype Fords were rolled out in a glossy Sea Blue scheme that later changed to a glossy Insignia White for the world speed-record attempts. The Douglas Testing Division flew a group of Skyrays with various combinations of red or Day-Glo trim over a white finish.

Most Skyrays were painted in the typical Gull Grey with the Insignia White undersur-



PHOTOS BY MARK A. FRANKEL & TONY NUNEZ

Main and nose landing gear hatches are cut from the fuselage. Dave Platt Models nose gear.



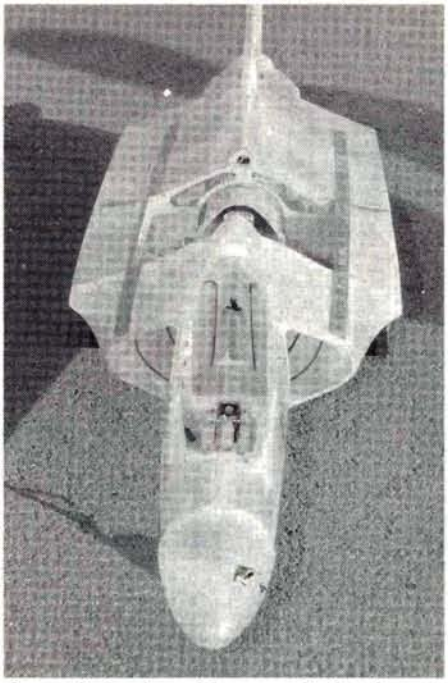
TWO OF THREE PLANS SHEETS ARE SHOWN. PLANS COME WITH A PHOTO-ILLUSTRATED CONSTRUCTION BOOKLET.

face color scheme that became standard in the late 1950s. These aircraft were often decorated with elaborate squadron markings that are documented in the following books and articles:

- *The Official Monogram U.S. Navy and Marine Corps Aircraft Color Guide, Volume 3, 1950-1959*—John M. Elliott, Maj. USMC Ret.
- *Naval Fighters* No. 13: "Douglas F4D Skyray"—Nick Williams and Steve Ginter
- *Navy Air Colors Volume 2, 1945-1985*—Thomas E. Doll, Berkley R. Jackson, William A. Riley
- *Famous Airplanes of the World No. 12: Douglas F4D Skyray*—published by Bunrindo Company, Ltd. (the publishers of *Koku Fan* magazine)
- *The American Aviation Historical Society Journal:* Vol. 23, No. 2; Vol. 26, No. 2; Vol. 30, No. 2. These issues contain the three installments of "The Douglas Skyray in Fleet Colors" by Nicholas M. Williams.

Airfix manufactures an excellent 1/72-scale plastic replica of the Ford (Airfix kit 03027) which is extremely valuable for panel lines and other surface detail.

I painted my models with K&B Superpoxy and Petit Paints Hobbypoxy paints. The first two proof-of-concept models received a Mylar covering on their wings. I am particularly impressed with Carl Goldberg Model's Ultracote. The competition airplane received a more permanent finish with Dan Parson's .6-ounce glass cloth saturated with Pacer Z-Poxy Finishing Resin.



Composite fuselage airframe awaits the wings.

A complete set of dry-transfer markings is available from Aeroloft Designs, 2940 W. Gregg Dr., Chandler, AZ 85224; (602) 838-0447. These markings were developed from the Navy's Maintenance Manual on the F4D, therefore, they are accurate in size and color.

ENGINE AND RADIO INSTALLATION

All of my Skyrays use a Jet Model Products Dynamax fan with an O.S. .91 engine and a Violett tuned pipe. I am currently pressurizing the fuel system with a Jet Model Products Pressure Vent System, and I am controlling the fuel mixture with a Jet Model Products Remote "Air Adjustable" Needle Valve. The 14-ounce Du-Bro fuel tanks are mounted on either side of the tail pipe and are linked to the needle valve with "T" fittings.

The airborne battery pack (1200mAh) is located in the radome, while the receiver and the retract air bottle are carried between the two branches of the inlet duct. Be sure that these components don't interfere with the path of the starter probe.

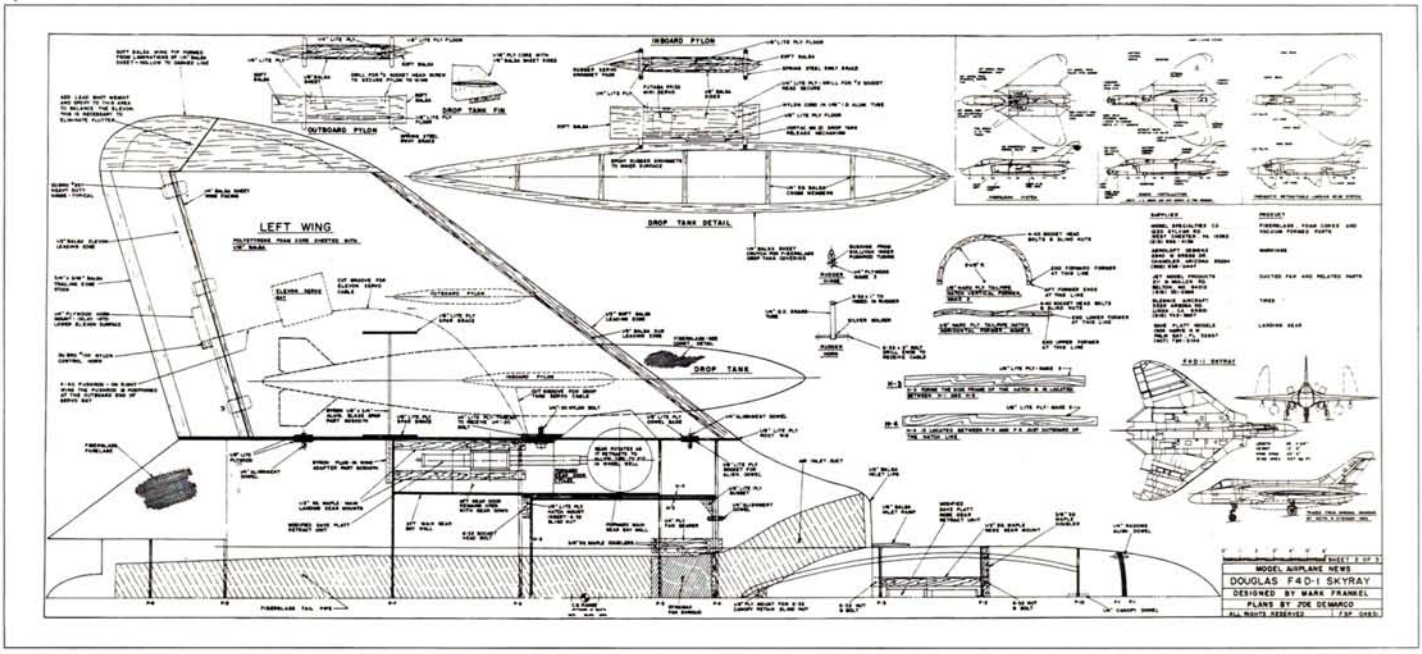
The elevon throw should be set up to provide at least 2 inches of up and down throw for pitch (elevator) and approximately 40 percent of that for roll (aileron). Normally, I fly the Skyray in high pitch rate and low roll rate throughout the entire flight. The Skyray needs plenty of pitch authority at low air speed, but it's highly sensitive in roll. The rudder is rarely used in flight. A 1-inch throw to the right and left is adequate.

PREFLIGHT AND TEST FLIGHT

With all equipment installed and all the systems working, the model should balance within the envelope shown on the plans. The optimum center of gravity seems to be 22½ percent of the mean aerodynamic chord.

The powerplant should be set up to provide a consistent run in all attitudes with any fuel level in the tanks. The "air adjustable" needle valve should be set slightly rich. The full lean setting is used only for takeoff, and

(Continued on page 107)

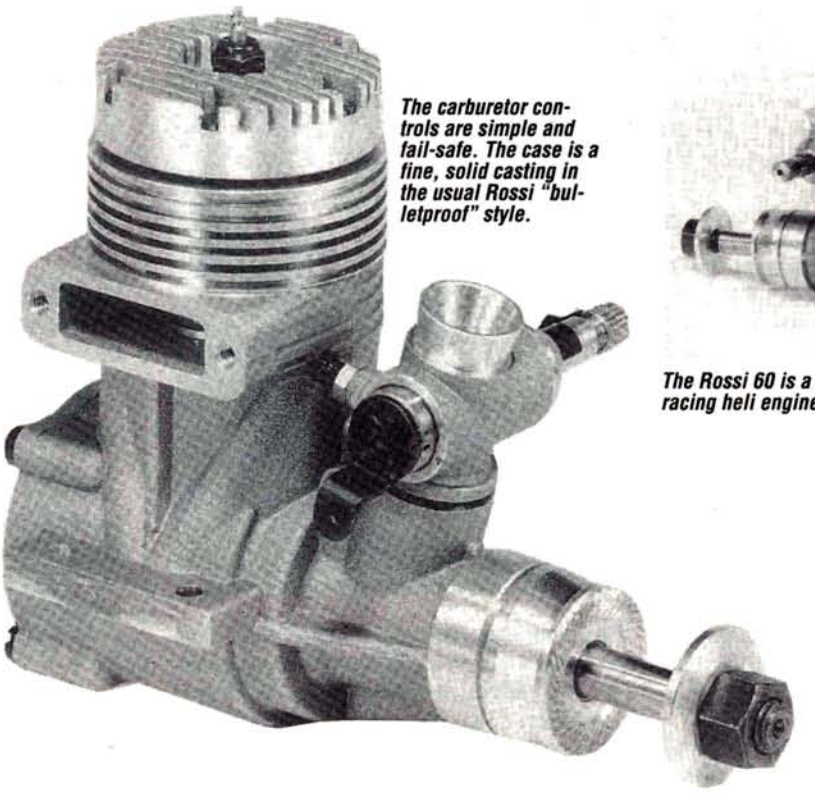


PLANS MAY ALSO BE ORDERED. SEE PAGE 121

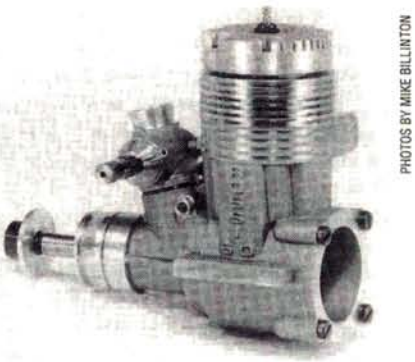
ENGINE REVIEW

ROSSI R60 HELI

by MIKE BILLINTON



The carburetor controls are simple and fail-safe. The case is a fine, solid casting in the usual Rossi "bulletproof" style.



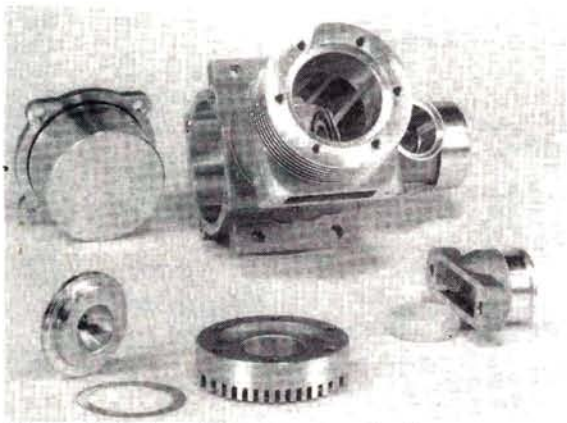
PHOTOS BY MIKE BILLINTON

The Rossi 60 is a good example of today's top racing heli engines.

AN ITALIAN THOROUGHBRED FOR THE COMPETITION HELI PILOT

DEMANDS MADE by the FAI in international, aerobatic, F3C helicopter competitions have brought 2-stroke racing engines to the fore.

Just as in the F3A fixed-wing aerobatic class, F3C requires strong, predictable, repeatable engine performance. Heli pilots aren't being pressed to reduce sound (and rpm) levels, and their rotors *need* higher rpm to reach the desired speeds. For aerobatics, helis need higher forward speeds to increase inertia, but this leads to an imbalance of rotor lift. This introduces a tendency to roll, and that interferes with precise aerobatics maneuvers. So far, the answer has been to substantially increase rotor-head speed; this offsets the tendency to roll because it equalizes—or almost equalizes—rotor lift. (Counter-rotating twin rotors are a possible solution, but are too complicated!)



The head button's squish area is noteworthy. Here, you can see three of the five transfer passages.

For the higher speeds you need for competition aerobatics, you need a more powerful engine (gearing-up isn't yet a satisfactory answer). So, contrary to trends elsewhere in the hobby, heli rpm and horsepower have been encouraged upward. (We see a similar situation with the ducted fan.) Heli fliers are looking for racing-engine performance; tuned pipes are the norm; and increasing percentages of nitromethane in fuel are noted.

Typical of this trend—and probably one of the most powerful—is the Rossi R60 engine tested here.

CONSTRUCTION

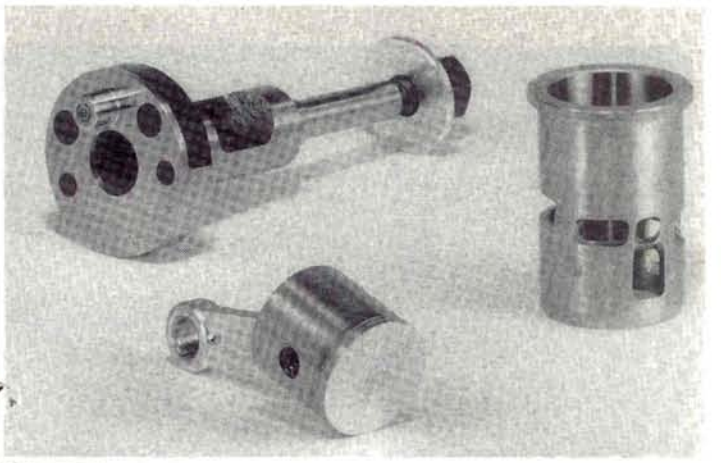
The solid, standard, cast-aluminum-alloy, one-piece crankcase has a front-induction spigot. Inside, there are five transfer passages: two main; two small side; one boost; these are all linked with similarly positioned ports in the cylinder liner. The R60's construction is of Rossi's typical, high-quality ABC, and it's certainly vital to its smooth delivery of high power.

Near its crown, the plain, high-silicon piston has two small turned grooves that probably act as oil reservoirs—insurance against running lean. Above the top groove, the piston tapers very slightly to 1½ thousandths inch (undersize, to offset thermal expansion at the crown).

The usual, two-piece, Rossi cylinder head has a separate, domed, combustion-chamber button and large squish

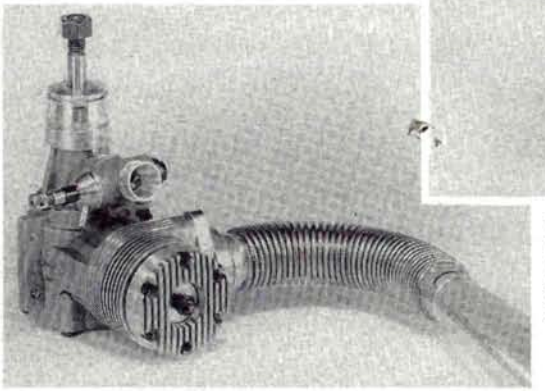
area that's 66 percent of the piston area. For a 10cc engine, the squish-band clearance of .014 inch is close and gives a fairly high effective-compression ratio of 9.4:1. This completes the picture; the R60 is tightly set up and was designed to perform best on low-nitro or non-nitro fuels.

The standard head gasket used to achieve this clearance is .007 inch thick. If you want a slightly lower compression ratio of 9:1 to use a fuel with more nitro—say, up to 25 percent—use the extra .004-inch shim that's provided.



The Rossi's high-silicon piston has two grooves, and it tapers at the crown. The crankshaft has carbon-fiber "fill-ins" to increase base compression. Note the extra-small transfer ports (with their supplementary passage) in the liner. There are five transfer ports and one exhaust port.

Notable on this test engine is the tight fit of the wristpin to the connecting rod's little end. Knowing Rossi's accuracy, this was almost certainly deliberate. At both ends, the connecting rod is bushed and has lubrication holes.

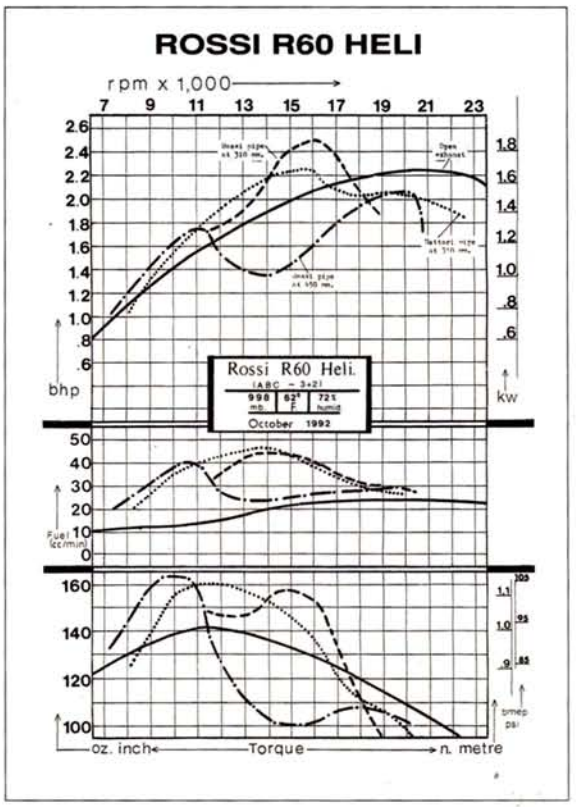


The convoluted Hattori metal header pipe with screw and "fixings" is innovative and practical. Its position can be changed easily.

The hardened-steel crankshaft has Rossi's unusual counterweighting, and the periphery and webs are filled with carbon fiber to decrease crankcase volume and improve both fuel draw and combustion-chamber charging.

The new, 8.5mm bore carburetor is of the usual twin-needle style. It seems to have been designed to have more structural rigidity and more precise control and response than the earlier model. There's also a version in which a coarse thread and lever allow in-flight servo control of the fuel settings. This is now almost a necessity for serious tuned-pipe operators, not only because much power is lost if fuel settings "drift," but also because it helps to prevent fuel settings from becoming dangerously lean in flight.

Italian engine manufacturers are almost alone in scorning the use of pressure pumps and regulators. In aerobatic maneuvers, they prefer to overcome G-forces by relying on the well-proven, much simpler pipe pressure to the fuel tank. The absence of such pressure pumps might be why these fine, Italian, racing-type engines aren't as numerous as others in aerobatics events. They also aren't advertised much and aren't well-distributed, so most competitors don't think of using one, but they are, in fact, capable of being front-runners.



TESTS

I used two different tuned pipes.

• **Pipe 1.** The engine comes with a pipe that has a "quiet" can at the rear, and it also has the usual, effective, spring-fitted, curved exhaust manifold. From plug to first maximum diameter, the pipe measures approximately 45cm. Previous results suggested that this would give a low-rpm peak resonance near to 10K—much too low for the high rotor speeds we want. No manufacturer's recommendation was available at the time of the test and, because the manifold can slide inside the pipe itself, there was no clear way to assess the length at which it should be used.

• **Pipe 2.** The length of the newest Hattori 650S pipe is determined by a convoluted metal header that can be conveniently screwed into place at each end. The Hattori pipe can easily be bent to any required shape, and it was popular among a select group of fliers at the European Helicopter Championships in Austria. It was used with Picco and Webra engines by the first- and second-place fliers and, overall, six out of the top 10 used it.

Before the tests, I thought that the Hattori's major advantages were its practical set-up and probably flexible performance. I also thought that the Rossi pipe would allow more power but perhaps offer a narrower performance band.

• **Test 1: Open exhaust**—fuel 10 percent nitro/15 percent castor oil. Plug—Rossi no. 5.

Rossi recommended this fuel, and I used it throughout the tests. After a short running-in in this open-exhaust form, the torque figures I obtained were obviously linked with high sound levels and, as usual, covered a wide rpm spread.

• **Test 2: Rossi heli—**pipe fixed at its maximum length of 45cm; fuel and plug as in Test 1.

As suspected, this configuration caused maximum resonance to occur low down the rpm scale—actually, at 9,390rpm. As rpm were allowed to rise, another peak was reached at nearly

SPECIFICATIONS

WEIGHTS & DIMENSIONS:

Capacity: .....0.6051 cu. in. (9.916cc)
Bore: .....0.9405 in. (23.89mm)
Stroke: .....0.871 in. (22.12mm)
Stroke/bore ratio: 0.926:1
Timing periods: .....Exhaust—170°
Transfers—116°
Boost—116°
Front induction—Opens 35° ABDC
—Closes 63° ATDC
—Total period 208°
—Blowdown 27°

Combustion volume: .....0.85 cc
Compression ratios: .....Geometric—12.66:1
Effective—9.4/1
Exhaust-port height: .....0.242 in. (6.17mm)
Cylinder-head squish: .....0.014 in.
Cylinder-head squish angle: .....0°
Squish-band width: .....0.198 in. (5.05mm)
Carburetor bore: .....0.333 in. (8.5mm)
Crankshaft diameter: .....0.668 in. (16.97mm)
Crankshaft bore: .....0.460 in. (11.69mm)
Crankpin diameter: .....0.275 in. (6.99mm)
Crankshaft nose thread: .....0.305 in. x 20 TPI (8x1.25mm)
Wristpin diameter: .....0.236 in. (6mm)
Connecting-rod centers: .....1.65 ins. (42mm)
Engine height: .....4.08 ins. (103.7mm)
Width: .....2.43 ins. (61.8mm)
Length: .....3.78 ins. (96.1mm)
Width between bearers: .....1.76 ins. (44.7mm)
Mounting-hole dimensions: .....2.08 ins.x 0.98 in.—0.17 in. holes (52.8x24.9x4.3 holes)
Ex. manifold bolt spacing: .....1.42 ins. (36mm)
Frontal area: .....7.5 sq. ins.
Weight: .....Bare—20.1 ozs. (570g)
—with Rossi pipe/manifold—27.3 ozs. (774g)
—with Hattori pipe/manifold—26.9 ozs. (764g)
Crankshaft weight: .....39.5 ozs. (112g)
Piston/rod weight: .....0.70 oz. (21 g)

Performance:

Max. b.hp: 2.47 @ 16,170 rpm (Rossi heli pipe @ 310mm/10 % nitro)
2.23 @ 15,876rpm (Hattori heli pipe @ 310mm)/10% nitro)
2.22 @ 20,610rpm (open exhaust/10% nitro)

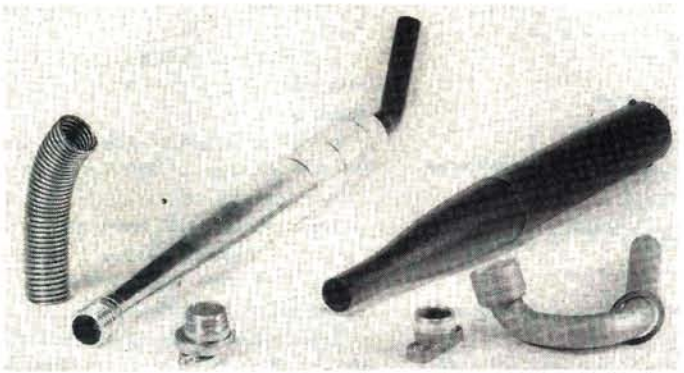
Max. torque: 162 oz.-in. @ 9,390rpm (Rossi pipe @ 450mm/10% nitro)
160 oz.-in. @ 11,985rpm (Hattori pipe @ standard length/10% nitro)
157 oz.-in. @ 14,526rpm (Rossi pipe @ 310mm./10% nitro)
141 oz.-in. @ 11,312rpm (open exhaust/10% nitro)

RPM on Standard Propellers:

	Open exhaust	Rossi pipe @ 450mm	Rossi pipe @310mm	Hattori pipe @310mm
13x10.5 MK	8,140	8,730	-	8,032
13x6 Top Flite	11,586	11,180	-	-
13x6 MK	11,646	-	11,879	12,141
12x6 Graupner	13,072	-	13,860	13,620
11x6 Graupner	14,709	-	15,670	-
10x6 MK	15,714	14,125	16,030	15,600
10x6 Master	17,018	-	-	-
10x6 APC	17,417	16,580	17,496	16,900
10x4 Zinger	18,530	18,260	-	-

Performance Equivalents	Open/Exhaust	Rossi pipe
B.hp. /cu.in.	3.67	4.08
B.hp. /cc	0.22	0.25
B.hp. /lb.	1.76	1.45
B.hp. /kilo	3.89	3.19
oz.-in./cu.in.	233.00	267.70
oz.-in./cc	14.20	16.30
oz.-in./lb.	112.20	94.90
Newton meter/cc	0.10	0.117
B.hp. /sq.in. frontal area	0.29	0.33

Manufacturer:
Rossi Motors, Cellatica, Italy



Left: the new Hattori pipe with rubber deflector at the end. Right: the Rossi curved-manifold-style pipe.

twice that figure, and another harmonic resonance was reached. In this test, it's of a lower order because, dynamically, a fuel-enriched acoustic pulse is returned to the cylinder on alternate piston strokes, instead of the more efficient once per stroke.

I've been expecting to find this since the advent of low-dB/low-rpm long pipes that allow (on the dynamometer, at least) a 10cc engine to operate well mechanically at both 10,000rpm and 20,000rpm (for example, the Webra 60 long-stroke and the O.S. Hanno long-stroke). Earlier engine designs operated at around 15,000rpm, and there was no likelihood of them reaching the harmonic of 30,000rpm.

With this engine, there's a powerful second peak near 2.1hp, at 20,151rpm, and a first peak near 1.8hp at 10,900rpm. That's a wide enough band width, surely!

Unfortunately, there's a massive "hole" in torque between these peaks, and it probably prevents any realistic use of the main part of the torque band.

• **Test 3**—Rossi pipe shortened to 31cm; fuel and plug as in Test 1.

I guessed a pipe length that I hoped would make resonance occur at close to 16,000rpm. (It coincided with the Hattori pipe length of 31cm from plug to first maximum diameter.)

A sluggish performance at approximately 12,000rpm was followed by a strong power flow at 16,170rpm and a fairly swift decline thereafter. The horsepower maximum at 2.47 was very near the manufac-

turer's figure of 2.5hp at 17,000rpm. I used 10-percent-nitro fuel and a tuned pipe operating at approximately 16,000rpm. The only comparable result is from an earlier test of a YS 60 heli engine that reached 2.56hp—mainly achieved by pushing rpm to 19,500.

• **Test 4**—Hattori 650S pipe at 31cm; fuel and plug as in Test 1.

"The Rossi R60 helicopter engine has proven itself to be a superior performer."

This pipe uses the usual Hattori internal, flat, reflector disk for acoustic return wave. It's interesting that the broad power band has a relatively flat top, i.e., from 12,500 to 20,500rpm; power was more than 2hp at all times. Above 2hp, this Rossi pipe's power band, which runs from 13,500 to 18,300rpm, can be compared with the Hattori's power band.

If you need a band width of 8,000rpm, the Hattori pipe is a must. Of course, you must treat all these results with some caution. If the Rossi pipe were also checked at say, 34cm, we might well see a less powerful, but wider power band like that of the Hattori pipe.

• **Test 5**—Hattori pipe and 30-percent-nitro fuel; with the extra .004-inch head shim installed. Although they aren't shown on the graph, I took a few brief "spot" readings using 30-percent-nitro fuel. Torque reached 180 ounce-inch at 11,000rpm and then declined to 145 ounce-inch at 16,000rpm. For a tuned pipe, this is still a very flat horsepower curve. (The maximum was 2.4hp at 15,000rpm.)

IDLING

With the Hattori pipe at the fixed length, using Rossi's new carb, and with pipe pressure going to the fuel tank, the engine reached an easy, very even idle of 2,000rpm, and throttle response in both directions was startlingly crisp.

SUMMARY

The Rossi R60 helicopter engine has proven itself to be a superior performer. It's also durable and easy to operate, so only major user carelessness could harm its potential.

After the 95 runs made to gather the data, its condition was virtually unchanged.

I thank Kenneth Rainey, Ian Mulholland and Liam Broderick (of the All-Ireland helicopter team) for help with equipment and information used in this report. ■

SPORTY SCALE TECHNIQUES

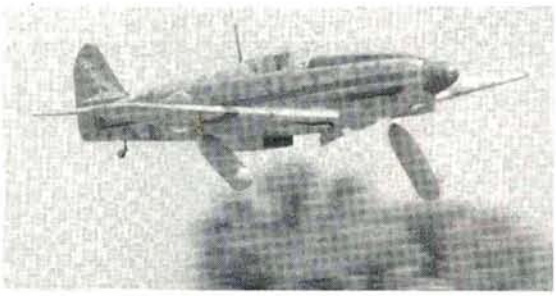
FRANK TIANO

TOP GUN & GEAR BOTTOMS

NO DOUBT, most of our readers have seen the outstanding coverage of the '92 Top Gun Invitational compiled by our excellent editor, Major Tom Atwood. But some of you have written that you want even more information—more "stuff"—like what's really going on in the background of Top Gun. This month's column will deal with those requests, thereby saving hundreds, maybe thousands, of you from writing in.

Along with 60 or so of the finest scale aircraft and pilots from all over the world, Top Gun offers a unique setting and atmosphere for a world-class competition. The Palm Beach Polo and Country Club flying site is probably the largest, best prepared grass strip in the entire universe! The field is large enough to accommodate four flight lines spaced safely apart, and it has covered, comfortable seating for 8,000 fans with a view of the action that I am told actually surpasses being at the flight line. These grandstands not only feature an excellent view but also place the spectator within 60 seconds of some of the finest food and beverages this side of a Club Med. Just a short walk through the tunnel that connects the flying field with the concession area will afford all kinds of surprises. Along with a 40-foot cocktail bar, several food vendors offer some of the most delicious and unusual dishes you have ever seen. The entire concession area is under some sort of protective cover. And for those in the family who might want a break from the action, there are several gift shops right on the premises.

Absolutely beautiful grounds at the Polo Club. This area is for manufacturers' displays. Lots of room and a laid-back atmosphere.



You want action? Tiano's "Tony" caught in the act of dropping its tanks by none other than Rich Uravitch. Taken from the grandstands with a telephoto lens.

At one end of the grandstands is an area the Polo has allocated for our vendor area. That's right; several manufacturers come to Top Gun and set up their trade-show-style booths right outside in the beautiful Florida sunshine under some brightly colored tents. The ideal location allows you to browse and to talk to these people and still keep an eye on the flying field. For 1993, there are already 24 manufacturers signed up to display their wares. And to keep you all informed on exactly what's going on, Top Gun employs the expertise of Sam Wright, possibly the best airshow announcer in the U.S. today, along with Dave Platt, possibly the world's most knowledgeable expert on aviation trivia and Alex Kaplan, possibly the fastest-rising sidekick in the hobby industry, who constantly keeps the Polo's outstanding sound system chock-full of information and announcements. Last year, using a novel trivia game for the spectators, these three men gave away over $2,000

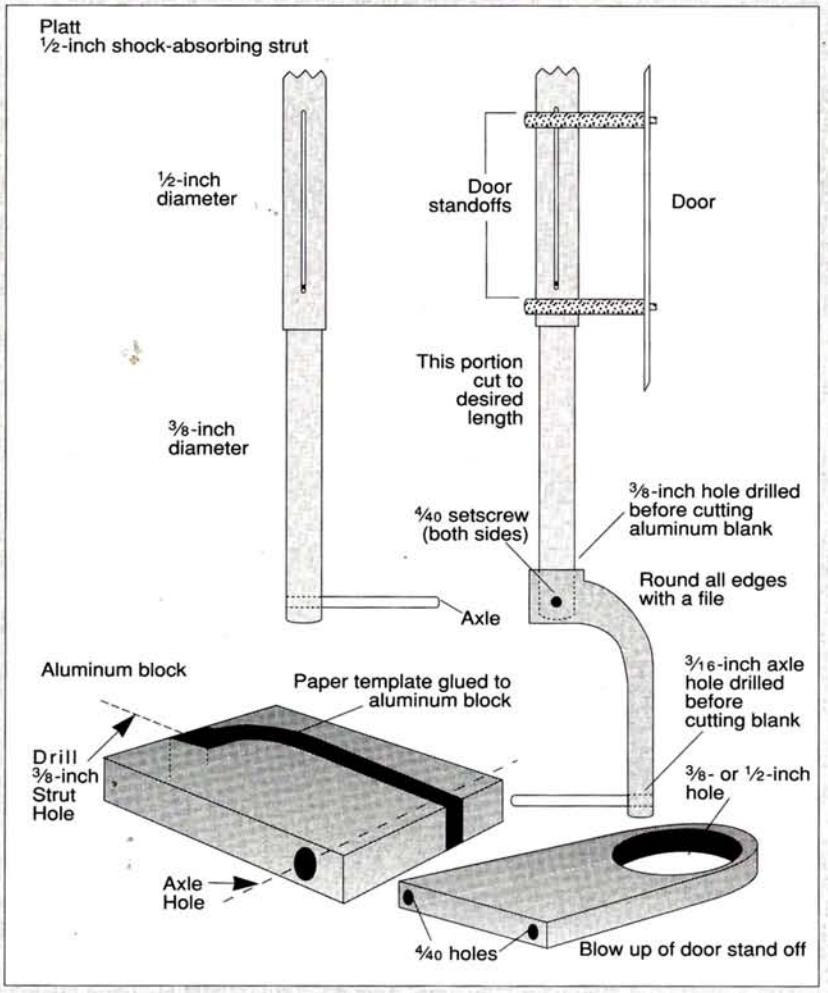
The man who helped to start it all—Dave Platt, announcer and all-around sweetheart who started 80-inch-scale airplanes 14 years ago.

MAKING SCALE STRUTS

One of the most-asked questions that we've received concerns landing-gear struts. For many modelers, a frail-looking set of wire landing-gear struts just won't do justice to their new airplane. Of course, scale-looking struts may be purchased from many sources, but you must remember that, usually, these struts are intended for a specific airplane. For example, you wouldn't expect a set of Gene Barton struts for an 80-inch Platt Mustang to fit the Ziroli 100-inch job. Well, maybe you would expect it, but you'd be wrong! Anyhoo, this is the problem we're confronted with most: available struts are made for one specific scale. So what do we do?

The answer is simple: make our own struts. And yes, it really is simple as long as you are willing to invest in just two things: time and patience. Will you need special tools? Yes, a band saw is a must, and you'll also need a Dremel tool and some assorted bits, a couple of metal files and some elbow grease.

To start, draw a front and side view of your strut to exact size. (Some guys have a copy center blow up their three-view drawing for this.) Buy a pair of Dave Platt struts and cut them to the appropriate length. Next, from a block of aluminum, cut the shape of the lower strut (sometimes called the "yoke" or "fork"), and round off all the edges with a big file. Drill all the holes in the aluminum blank before cutting. These includes the axle hole and the ½-inch hole that will accept the Platt upper strut later on. Small pieces of 3/16-inch aluminum sheet can be drilled and filed to make the standoffs for the gear doors. Check out the drawing, and I think that you'll see exactly what I'm talking about. And, remember, not all struts have the yoke attached. Many, like a FW-190, for example, are simple, straight affairs with the axle hole drilled at an angle. In this case, a set of Platt struts and some "gingerbread" scale dress-up attachments are all that's needed. For a perfect-looking job, have your new struts sandblasted to remove all the little file and scrape marks. As you will see, the completed work will not only look very professional but will also give you a great deal of satisfaction.* *Dave Platt Models, 1306 Haure NW, Palm Bay, FL 32907 (407)724-2144*



This "industrial-sized" model came all the way from England with its builder, Rich Crapp. It won the best bipe award. There's lots of neat stuff like this at Top Gun.

worth of door prizes.

The Palm Beach Aero Club is your host and has become one of the most respected model aviation clubs in the country because of the courteous, professional and knowledgeable way that they conduct themselves at Top Gun.

Along with a fantastic flying site, a great AMA club and some of the hottest pilots in the world, Top Gun offers much, much more. For example, on Thursday and Friday, all AMA members are allowed limited access to the pit area while static judging is going on. There is plenty of demonstration and practice flying. Saturday and Sunday are reserved for the four rounds of flying competition, and there's a generous break for demonstration flying as well. Last year, we were treated to demos by Bob Fiorenze and his swing-wing F-14, the Cloud Dancers, Bubba Spivey and Wayne Voyles flying their Zap Stingers in aerobatic formation and Bob Violet's 200+mph Viper. And if that's not enough to fill your day, try the nightlife! Thursday evening features a cocktail party, and everyone is invited. Friday night there's a semiformal cocktail party for contestants, the press and anyone who has purchased a ticket.

Just a small portion of the awards. Genuine silver loving cups and urns make worthwhile keepsakes. Sam Wright and Frank Tiano get ready to start the presentations.

More TG action! Bill Steffes' B-25 in the capable hands of team member Nick Ziroli Sr. makes a quick flyby. Check out how effective that camouflage is.

Saturday's dinner dance and roast requires dressy attire and a ticket. Many awards are given out at this affair, and to say that we all have a few laughs would be quite the understatement.

Last, and certainly not least, we have the sponsors of Top Gun and what their contributions do for the event. *Model Airplane News* donates magazine space for our advertising and picks up a portion of the judges' expenses and pilot awards through a cash donation. Pacer Technology and the Zap gang also contribute cash, which is used for judges' expenses and awards, as well as for hats and adhesives for every contestant. There are several secondary sponsors who donate the bulk of the merchandise awards for Top Gun, and we are dearly indebted to these folks because, without them, TG just would not be the same. What's nice is that you can easily meet and chat with most of the sponsors or their reps since almost all make an appearance.

So that's what you can expect from Top Gun this year and in the years to come. For '93, we are once again sanctioned by the AMA and have their blessings. I don't think you can go anywhere, other than Madera, and get as much excitement. TG's flight rules call for some interesting maneuvers and a fast flyby, as well as a slow one for some great photo opportunities. Pretty good formula don't ya think? And an easy one, too! Just take one of the most fabulous flying sites, invite 65 of the world's best pilots and aircraft, provide a trained team of judges, spread it over four action-packed days, offer some fantastic evening events, host it by one of the sharpest clubs in the USA, get it backed by every major hobby manufacturer, and hold it in sunny Florida while parts of the country are still snowbound, and you can't lose. That's Top Gun. See you there ■

LAMINATED BALSA

(Continued from page 13)

of the adhesive and filler on the surface.

By using thin balsa (1/16 inch) and letting the grain roll around the curves at an angle, I was able to sheet the fuselage up to the cockpit chin, where the contour takes a sharp upward turn (see Photo 7). I applied a second sheet of 1/16-inch balsa over the first layer, again with the grain running at an angle. I found that thin balsa was flexible enough to roll around the aft portion of the fuselage and that it covered the helical contours nicely. I had achieved the desired 1/8-inch thickness and the strength I wanted (see Photo 8). In the close-up of the firewall, the laminations are clearly visible (see Photo 9).

LAMINATED HATCHES

I needed hatches to access the servos, which would be installed in the rear section of the fuselage. That meant cutting out pieces of the curved sheeting. To ensure that they would keep their curved shape after being removed, I once again used the lamination technique to beef-up the hatch and the area surrounding the opening (see Photo 10).

I used balsa strips that were an 1/8 inch thick and 1/4 inch wide to "outline" the hatch cover and the area around it on the inside of the fuselage. At the hatch corners, I pushed a pin through the sheeting from the inside. Then I marked the cut lines on the outside (see Photo 11). The additional 1/8 inch produced a 1/4-inch-thick hatch around the edge and a 1/4-inch frame around the hatch opening. When the hatches were cut out, everything kept its shape nicely, and it even looked good (see Photos 12 and 13).

Now that I've discovered that laminating works so well, in the future, I'll eliminate the extra weight of planking or balsa blocks wherever I can. You may want to do the same! ■

COAL HAULER

(Continued from page 32)

At this point, you can hinge the elevator and the ailerons. I use CA-type hinges and have found them to be simple, quick and dependable. I use 1/2A or short control horns for all the control surfaces with 4/40 rods for the ailerons. On the elevator, I use 1/16-inch music wire running through two or three pieces of Nyrod inner tube cut to a length of about 1 1/2 inches. These tubes are taped into place along the main and subboom to support and guide the music wire.

At this point, I installed the landing gear, the engine and the fuel tank (a 2-ounce tank held in

(Continued on page 94)

Basic Soldering Techniques

by GEORGE A. WILSON, JR.

Editor's note: this article provides an introduction to basic soldering techniques that are usful in modeling. Readers who wish to pursue techniques that involve high-wattage irons or gas torches are urged to seek expert help and to follow all manufacturers' recommendations closely.

WHEN WE SOLDER, we join two metal objects with a melted metal alloy that sticks to ("wets") both. The solder is usually an eutectic alloy—a mixture of metals that melts at a lower temperature than its component metals.

- **Soft soldering** is done at relatively low temperatures and is generally used when wiring and assembling electronic components. Soft soldering can also be used to make landing gear and other similar parts.
- **Hard soldering** uses harder/stronger materials that melt at higher temperatures, and is used where mechanical strength is necessary.

Solders can be used to join a very wide variety of materials, but I'll limit my discussion to applications that are most useful when building model airplanes: joining copper, brass and steel to themselves and to each other. Soldering requires lower temperatures than welding. Welding melts the pieces to be joined, and the welding (filler) material (usually a welding rod) fills the joint.. Welding is seldom needed for model airplane construction and is beyond the scope of this article.

WHICH HEAT SOURCE? Soldering iron, gun, or torch?

For fine wiring such as servo leads, you should use a small soldering iron of 25 to 40 watts. A higher wattage will melt the insulation when you heat the joint.

For soldering music wire or flat plate (brass, copper, or steel), you should choose an iron of 100 watts or more, or a soldering gun or torch. Irons and guns are good for most medium-size projects, e.g., landing gear or cabane struts made of wire that's less than 3/16 inch thick. If you have thicker music wire or large areas to heat and join, consider using a propane torch or a butane torch.

BEFORE YOU PLUG IN YOUR IRON OR GUN...

Always check the cleanliness of the tip of your iron or gun. If the tip is badly pitted, use a fine file to reshape it. On soldering guns, always check that the two nuts that lock the tip into place are tight. If they are not tight, the gun will never heat up fully.

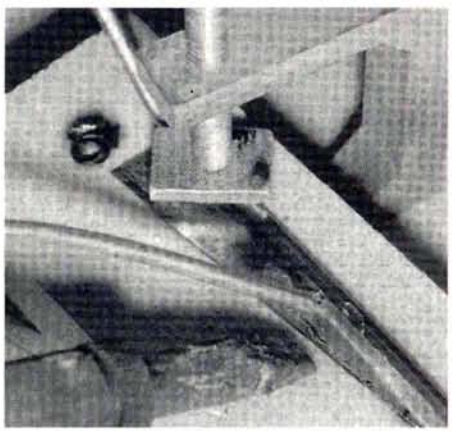
To keep the tip bright and clean while you are soldering, always have a damp sponge close at hand, and wipe the tip whenever it looks dirty.

Flux, heat and solder for the modeler

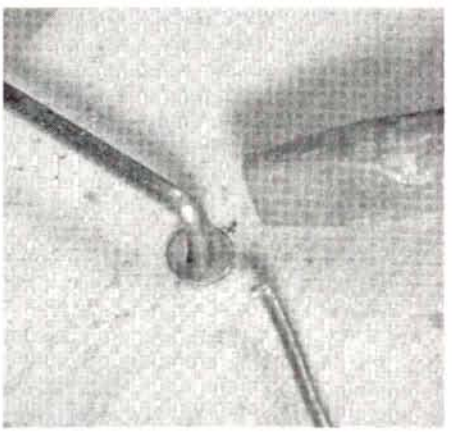
SURFACE PREPARATION

To ensure proper wetting, i.e., the flow of the solder onto the individual pieces, the bare metal to be soldered must be very clean.

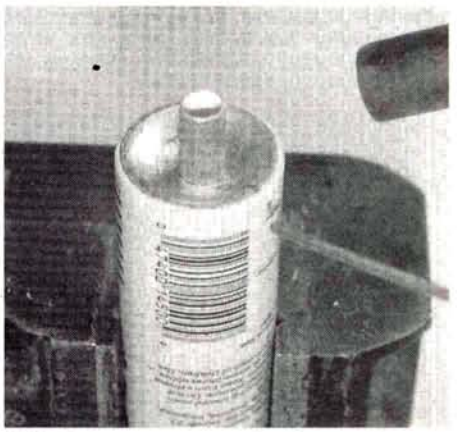
With electrical wiring, always strip back the insulation until you see bright, clean wire. Corroded areas will ruin the joint, so they must be cut away. Landing gear, music wire and large plates must be cleaned first with steel wool, sandpaper or a Scotchbrite® pad.



This landing-gear fairing is being soldered to its strut with no-lead solder. The parts were cleaned, coated with flux and then clamped together in their proper positions. A large soldering iron is being used to heat the assembly so that the solder flows over both sides of the strut and fairing. The residue will be removed with a cloth and mineral spirits or alcohol.



Backing washers for wheels can be easily attached by soldering the washers to the axles. To ensure that the washer is square with the axle, make a simple jig by drilling a hole of the same diameter as the axle in a piece of wood. Clean the parts, assemble them as shown, flux lightly and solder with tin/lead or no-lead solder.



With the low-temperature aluminum solders now available, you can solder aluminum parts together, without flux, using a propane torch. Here, an add-on muffler is being made out of a shaving-foam can. These solders form strong joints, but they don't flow readily.

FLUX

Flux is used to further clean the surfaces to be joined—beyond what you can see. There are two basic types: resin flux (rosin is a type of resin), and acid flux. Each type has a particular use.

For electrical joints, use only resin flux because it's the least corrosive. Most solders intended for electrical joints have resin cores and need little or no additional flux. If acid flux were used on wiring, it would wick along the wire under the insulation and quickly etch away the wire.

For small mechanical joints, use a resin flux, but for large joints, e.g., landing gear, use acid flux because it penetrates and cleans much more aggressively than resin flux.

Treat all fluxes as if they were corrosive. After soldering a joint, always remove the flux residue with mineral spirits and a stiff brush (you won't damage printed-circuit boards or wiring). Completely clean the soldered joint to neutralize any residual acid.

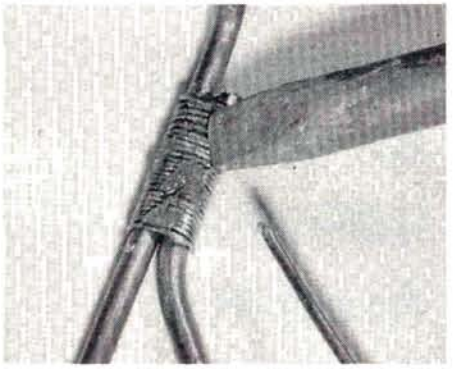
SOLDERING

What's the secret to good soldering? Heat the parts to be joined and *then* add the solder. If the joint is clean and hot enough, the solder will flow freely and help with the heat transfer. When soft-soldering, it's advisable to "tin" the parts, i.e., to wet or coat them with the solder, before you attempt to join them. Heat each piece separately, and flow solder onto it.

IDENTIFYING AND FIXING PROBLEMS

Cold solder joints are electrically and mechanically no good. They have a frosted appearance and are caused by one of these problems:

• Solder didn't flow freely into the joint because the metal or wire was dirty. If adding flux does not solve the problem, start again with fresh wire, or clean the metal sur-



(Above) Make strong wire landing gear by wrapping the wire joints with thin copper wire (either plain or tinned). For many such applications, soft solder works well, but for larger gear, you may wish to use a hard solder or a silver solder. The gear wires must first be cleaned with sandpaper, steel wool, or a Scotchbrite® pad to remove oil and/or corrosion. Build a jig to firmly hold the pieces to be joined. Position them so there's no gap between them, then flux the joint.

(Below) To ensure that there's enough heat, use a heavy (100W) iron. If the gear wire is thicker than ⅛ inch, use a larger iron, or consider using a torch. When the joint is hot, add the solder. If you have difficulty getting the solder to flow, scratch at the problem areas with the tip of your gun or iron to trigger wetting. When the joint has cooled, clean any area that has been exposed to acid flux with mineral spirits and a stiff brush. This type of joint can also be made using brass brazing alloy, brazing flux and a torch. If you braze, you won't need the wire wrapping, but you'll have to "jig" the wire firmly.

PHOTOS BY GEORGE A. WILSON, JR.

SOLDERING FINE WIRE

by DAVID BARON

This is the type of joint you have to solder when you replace a servo connector.

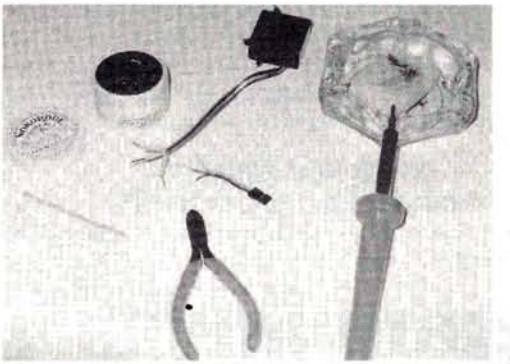
• Cut back the damaged/broken wire ends until you reach bright, clean. wire.

• If you're splicing-in a new section of wire or a new connector, estimate how much wire you'll need and add an extra ¼ inch.

• Strip ¼ inch of insulation off the end of the wires you plan to solder. Be careful to avoid nicking or cutting the wire while you do this. If the strands become untwisted as you remove the insulation, carefully re-twist them.

• Use the tip of a screwdriver to apply a little paste flux to the end of each bare wire.

• Next, tin the wires. Apply the soldering iron to the middle of each stripped section of wire. When the flux has been drawn into the wire, apply a little solder to the end of it. Stop when you see the solder reach the insulation. This should happen quickly and should take only a small amount of solder. Repeat this procedure on each piece of wire.



• Now that each piece has been tinned, use your wire cutters to trim each wire to be joined to exactly the same length. Trim the exposed end of each wire down to ¼ inch to ⅛ inch.

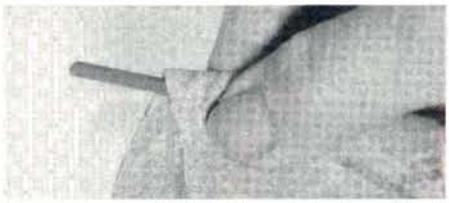
• Slip a piece of heat-shrink tubing over the wire, on one side of the joint to be soldered. (Its diameter should allow it to barely slide over the insulation on the wire, and it should be twice as long as the joint you're soldering.) Slide it at least an inch away from the area to which you'll apply solder. This will prevent it from being shrunk by the heat of the joint you are going to make.

• Make a "jig" to hold the two wires you plan to join. If your jig is metal, e.g., a vise or alligator clips, don't grip the wires too close to the part you're going to solder, or the metal will draw heat away from your joint. I like to use wooden clothespins, which I can position very close to the ends I plan to join (the wooden jaws don't act as a heat sink).

• The tinned areas of the wires should be touching and overlapping. With little or no pressure, heat the wires with your soldering iron until you see the solder flow, and then add a little more solder. The joint will be complete when you see a small fillet forming between the wires you're joining. Any more than this, and you're adding weight for no reason.

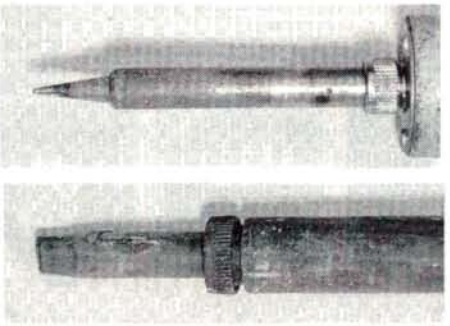
• Clean the joint with a Q-Tip® or paper towel that has been dampened with mineral spirits or solvent. If the joint is smooth and shiny, go on to the next step. If it looks frosted, it's no good; you overheated it or moved the wires while the solder was still molten. Add a little flux and re-solder the joint. If it gets too messy, you'll have to separate the wires, remove the excess solder and start over.

• It's now time to slip the heat-shrink tubing back over the joint. Shrink it with the heat gun that you use for covering. I don't recommend that you use a lighted match or a cigarette lighter because they make it all too easy to melt the tubing.

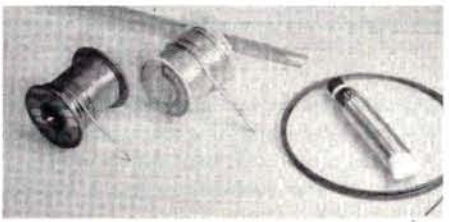


To ensure a good joint, the parts to be soldered (copper, brass, steel, etc.) must be free of all surface coatings (oil, paint, etc.) and corrosion. Don't depend on the flux to do the cleaning. Here, a wire landing-gear strut is being cleaned with fine sandpaper.

For a strong solder joint, fluxes are usually necessary. Here are several paste and liquid fluxes. Brass brazing usually requires the use of a water and borax flux; rosin dissolved in alcohol is convenient for electrical soldering (printed-circuit boards). Nokorode is a general-purpose, soft-soldering flux. Stay-Clean is a more powerful liquid flux for soft soldering. Special fluxes are used for aluminum soldering. Sears' aluminum solder is sold with the proper flux.



Soldering irons must be equal to the job at hand. Here are a 100W iron that's appropriate for heavy work, e.g., landing gear up to ⅛ inch in diameter, and a controlled-heat small iron for making electrical connections. The smaller iron comes with tips of various sizes and can be used at a range of temperatures.



Most of the solders used by modelers come in wire or rod form. This photo shows rolls of 60:40 (tin/lead) and no-lead solder; a coil of brass brazing alloy wire, a bundle of low-temperature aluminum brazing rods and a package of aluminum solder with its flux.

faces again and then re-solder.

• If a joint is moved before the solder has solidified, it will frost over. Add a little flux and re-heat the joint. If this doesn't help, you must start over. Remove excess solder with a Q-Tip® or a damp paper towel while it's still molten.

• If you use a torch, it's all too easy to overheat the joint. The solder will frost, and you'll have to remove it. Clean the parts again and start over.

TYPES OF SOLDER

Soft solder (tin/lead alloy)

For electrical joints, use a 60:40 (tin/lead) solder; for light, mechanical joints, use a 40:60 solder.

No-lead solder

This is now legally required for drinking-water pipes. It's primarily for mechanical joints. Use paste or acid flux as necessary, and use a large (typically 100 watts) soldering iron or a torch for heavy work.

Aluminum solder

Sears aluminum solder and flux (included) or the new solder rods that don't require flux, e.g., See Temp aluminum brazing rod, work well. Use a propane, butane, or a MAPP gas torch. This type of solder is primarily used to join aluminum and aluminum alloys.

Hard solder

Use this where you need strength, e.g., for landing gear, large engine mounts and cabane struts. Unlike soft solders, hard solders liquefy at temperatures above 650 degrees Fahrenheit. It isn't difficult to use, but it takes practice. The parts to be hard-soldered must be securely positioned in a clamp or a jig. The pieces to be joined should be liberally coated with flux and then heated until the flux liquefies and the pieces are red hot. Apply the solder by allowing it to come to temperature and melt onto and into the joint.

Silver alloys

Also known as "silver solders," these brazing alloys melt at around 1,100 degrees Fahrenheit, flow freely and make strong joints as long as the pieces to be joined are fit closely. The comments about torches and fluxes apply to silver solders, too.

I use the supplies mentioned in this article, but I don't claim that they're the best of their types. Soldering tools and supplies can be obtained nationwide from Sears, Radio Shack, plumbing and welding supply houses and hardware stores.

I thank Rich Zamachaj, who—with his detailed knowledge of soldering and brazing—was very helpful to me.

If you want to know more about soldering and brazing, I recommend "Welding Handbook, Volume II," which is available from the American Welding Society, 2501 Northwest 7th St., Miami, FL 33125. ■

COAL HAULER

(Continued from page 88)

place next to the engine pod with rubber bands) and made linkage connections for the throttle. I put a small piece of foam between the tank and the engine pod to help to reduce fuel foaming.

FLYING

I found the plane's CG to be in the middle of the balancing-point range, so I left it as it was. I followed the guidelines for the control-surface throws on initial flights.

The first flight was on a gusty evening. I checked the radio gear and, with the engine running smoothly, I pointed the plane into the wind and advanced the throttle. The plane was airborne in about 5 feet and required only slight aileron trim. The plane handled well despite the wind, and with its minimal deflections, the plane was very responsive and made tighter loops and quicker rolls than any sport plane. Because the wind continued to gust, I decided to land the plane.

The next morning was overcast, but the air was calm and the conditions were good. Knowing that the plane flew well, I moved the control surfaces to the maximum deflections recommended in the instructions and moved the CG back as far as I could within competition parameters. Set up this way, the airplane is remarkable. It can do loops so tight that it looks as if it's trying to bite off its tail; the roll rate is so fast that rolls become difficult to count. I know that sounds too good to be true, but that's just the half of it. You'll also be impressed with how controllable it is in slow, tight maneuvers.

Take your time getting used to its flight characteristics, and remember, this plane isn't designed to fly fast, so only use full throttle when doing maneuvers. Anyone who has flown this type of plane will be pleased with its performance—and anyone who hasn't? Well, don't plan to get much use out of whatever you *were* flying. Once you fly the Coal Hauler, you'll be hooked. You'll have fun-fly fever.

**Here are the addresses of the companies mentioned in this article:*

***Florio Flyer Corp.**, P.O. Box 88, 149 Scotland St., Dagus Mines, PA 15831; (814) 885-8360.*

***Satellite City**, P.O. Box 836, Simi, CA 93062.*

***Coverite**, 420 Babylon Rd., Horsham, PA 19044.*

AEROBATICS

(Continued from page 34)

elevator to maintain level inverted flight. Spin recovery should take less than half a turn (for most aircraft).

Last, pull the nose straight up, and let go of the controls. If the plane acts as if it wants to go on its back, carefully add some tail weight; this will force you to add down trim for level flight and will help to neutralize the plane's tendency to pitch "upward" onto its back during the "uplines." Most—if not all—of the pitching in the vertical can be eliminated by this alone, but if the condition persists and the CG is already as far aft as is reasonably practical, a small amount of downthrust—approximately ½ degree—should take care of the problem (on a good aerobatic design).

Certain aerobatic maneuvers, such as Lomcevaks, flat spins and snap rolls, are easier to perform with an aft CG. If you only want to do loops and rolls or train student pilots, a forward CG is appropriate.

Though fine-tuning CG placement is determined primarily by personal taste, it's well worth exploration and careful measurement—with respect to each aerobatic plane in your stable. Next month, we'll talk about one of the most intriguing maneuvers, the Lomcevak. Till next time. ■

UGLY STICK

(Continued from page 48)

gear had a good deal of "squat" to it. With all the good things about this kit, all complaints should be considered minor.

(Continued on page 107)

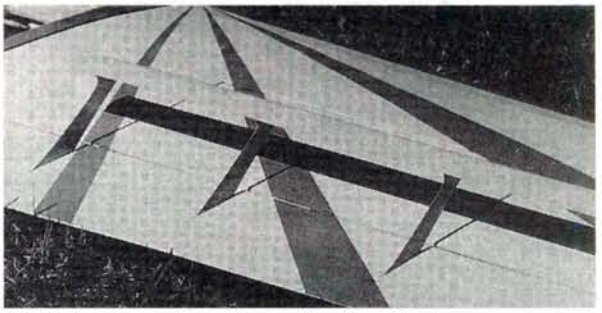
PART 2

HOW TO

by CARL RISTEEN

Practical Solutions

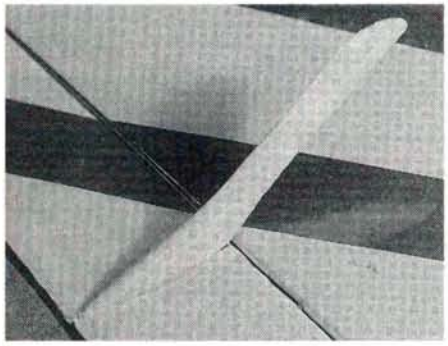
Flutter-
Causes and Cures



2. This is an experimental, combined, paddle-type aerodynamic balancer and mass balancer. It was designed for ailerons on an 86-inch monoplane.

FLUTTER HAS caused the demise of many fine models. It has a very cruel propensity to strike down valuable (particularly high-powered, giant-scale) models, which can deliver a crushing blow to the modeler. Understanding how it works its evil deeds can help you exorcise it from your models before it is too late.

Last month, in Part 1 of this article, I covered the cause of flutter and briefly glossed over some remedies. This concluding part will discuss in detail the various options available to prevent and fix flutter.



1. This "coffee stick" arm balancer is designed for inboard mounting on a control surface. To build it, 1/16-inch-thick lead pieces were cemented to the tip of the arm and then filed and sanded to a streamlined shape.

TIP BALANCERS

As I mentioned in Part 1, control-surface, tip-mounted balancers can cure about 95 percent of aileron or elevator flutter. The tip balancer should balance only part of the control surface's mass. In the most common wing-flapping mode of vibration, the wing or tail tips move much faster up and down than the rest of the control surface. As this is happening, the wingtip balancers develop an inertial counter-torque that's sufficient to balance much more of the length (mass) of the slower-moving inboard portions of the control surface than you might think.

When a control surface is not neutrally balanced and does not come to rest at neutral deflection, it has static imbalance. A tip balancer on a tapered wing that removes about 33 percent of the static imbalance (i.e., that has a 33-percent balance factor) will usually suffice to stop flutter. This tip balancer would provide full dynamic balance, i.e., it would prevent flutter, at least for the fundamental vibratory mode.

The balancer consists of a weight, usually lead, supported on some sort of arm that extends ahead of the hinge line. The longer the arm, the less weight is needed. Practicality usually dictates a maximum arm length of 1½ to 2 chord lengths. A shorter arm is less likely to be broken off and is structurally more convenient, but the additional weight required is near the wing or tail's trailing edge. This is undesirable, as it can invite flutter by itself, particularly if the wing or tail has significant torsional flexibility.

The weight can be conveniently located in a forward extension of the aileron or elevator and faired into the tip (see Photo 4). I prefer to use a knife balancer (Photo 3), because it looks better, and it gives less drag while the control surface is deflected. Tip-mounted aileron balancers can snag on grass and break off if a wingtip drags on takeoff or landing. Flexible 1/16-inch nylon-sheet tip skids that are cemented to the inside edge of the wingtip rib or block make good protectors and help reduce "asphalt rash" on the wingtips.

BUILDING A TRIAL MASS BALANCER

Minor flutter can frequently be heard but not seen, and that makes it difficult to determine whether it's in the ailerons or the elevators. Using a trial temporary balancer on each in turn will help unmask the culprit. I frequently use a straight-grained hardwood coffee stick for a trial balancer arm, unless the model is a real biggie. To reduce drag, the end of the arm that will carry the weight can be sanded thinner than the rest of the arm.

The base of the arm can be mounted to a streamlined plate of 1/8-inch plywood and cemented to the surface of a sheet-balsa control surface. On a built-up control surface, the arm can be mounted between two closely spaced ribs or, if the surface is covered with sheet balsa, just cemented to the surface. If the base is made large enough, it can even be temporarily attached with servo-mounting double-sided tape. The trial balancer should usually be mounted near the control surface's tip, so that if it does the job, a proper balancer can later be faired into the tip.

The arm should be quite stiff in the direction that the control surface moves and sanded to approximate an airfoil shape. It should be as close to horizontal as possible without hitting the wing or stab at the maximum deflection required of the control surface. I have also mounted the arm inside the wing on some very fast military RPVs, although this is complicated and tends to limit control-surface throw unless some kind of blister is used to accommodate it.

The coffee-stick-type balancers can be mounted on either the top or bottom of the control surface. On biplanes, I usually mount them under the upper wing and on the upper side of the lower wing. Mounting them under a low wing may result in damage by ground contact, unless they're well inboard. I use 1/16-inch-thick lead-flashing stock cemented to the sides of the arm near the end. I file it to an airfoil shape to reduce drag.

It is advisable to make the joint between the base plate and the control surface weaker than the arm. If the balancer is snagged on something, the base plate can be easily cemented back on. Repairing a broken arm is much more difficult.

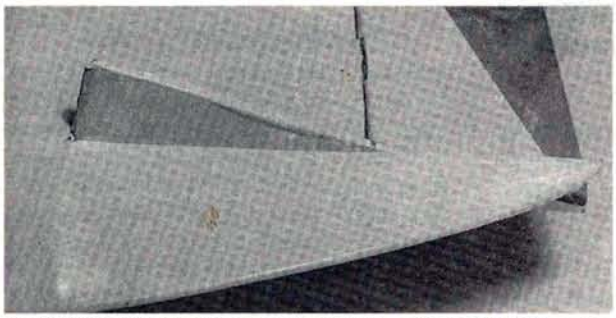
Balancer arms made of wire aren't recommended because of weight and drag considerations. Unless very heavy wire is used, the weighted arm may have a vibratory natural frequency of its own. That frequency could be low enough to excite one of the airframe's natural frequencies—with unhappy results.

INBOARD BALANCERS

If the tip-mounted balancer doesn't fully cure the flutter, add an additional inboard balancer, or move the single balancer inboard on the control surface. If a single balancer is to be used, it could be placed at about 60 percent of the span from the aileron or elevator inboard end and made heavy enough to provide about 80-percent static balance. A single inboard balancer is more effective than a single tip balancer, although it can't be faired easily into the structure like a tip-mounted balancer, and it tends to snag on things and break.

DUAL BALANCERS

Long, flexible ailerons may need a counterbalance at about 40 percent of the span as well as at the tips. If two balancers are used, the tip balancer should be about half the weight of the inboard balancer, and the total of the two should be no more than about 80 percent of the weight needed to completely balance the aileron about the hinge line. It is seldom necessary to balance the portion of the aileron that is very close to the wing root because the wing is heavily restrained against flexural movement by the fuselage. It doesn't move enough to excite the unbalanced aileron.



3. This type of "knife" tip mass balancer can be used on ailerons or elevators. It was made of ⅛-inch-thick light plywood, with a 1/16-inch-thick lead insert mounted in a slot at the tip.

If the ailerons have a fair amount of taper, the tip balancer should be about one third the mass of the inboard balancer, since there's less aileron mass to balance near the wingtips. (There are recognized techniques in the full-scale world for accurate sizing of balance weights. They require detailed knowledge of the airframe's structural dynamics and are beyond the scope of this article.)

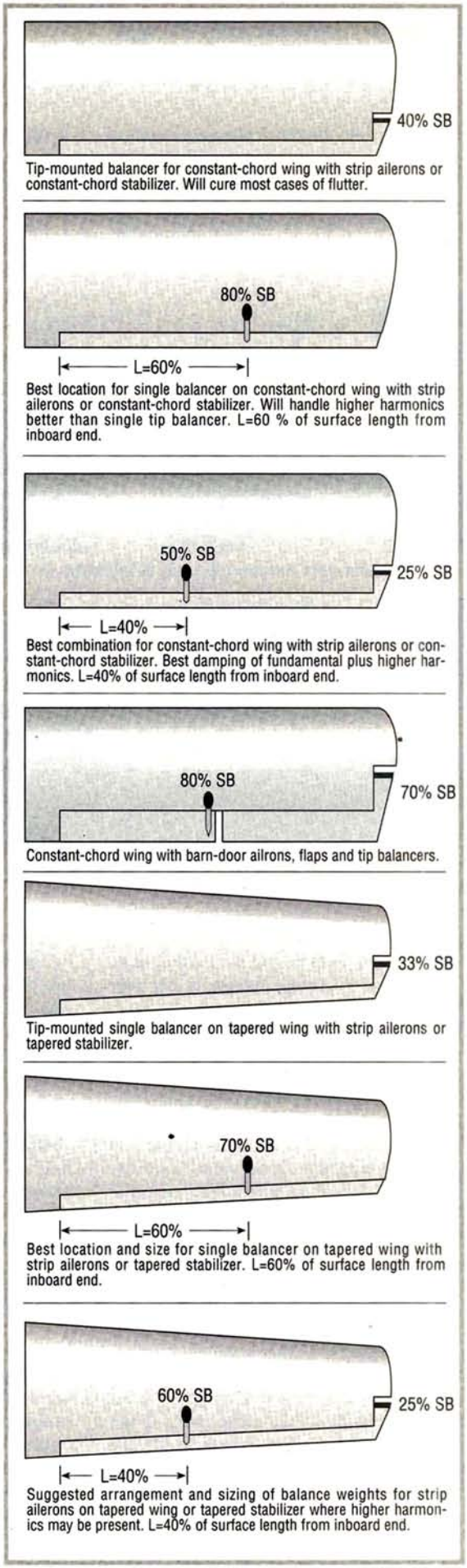
FLAP FLUTTER

Sometimes wing flaps develop flutter while the ailerons are unaffected. Flap flutter can usually be fixed by adding a single counterbalancer to the flap's outboard end. If this doesn't fully fix the flutter, a higher harmonic may be present that requires increasing the tip-balance factor to as much as 70 percent or adding a second inboard balancer.

To determine the percent-balance factor, I add lead weights to a balancer arm that has been tack-cemented to the control surface. Weights are added until the surface is in perfect static balance about the hinge line. Then I use the indicated fraction of the trial weight that achieved 100-percent balance. For example, if a 10-gram weight produces perfect balance, and I want a 50-percent balance factor, I cut the trial weight in half. As a practical matter, I may start with about 7 grams to allow for the weight removed by streamlining (particularly with inboard-mounted, arm-type balancers).

FULL WING FLUTTER

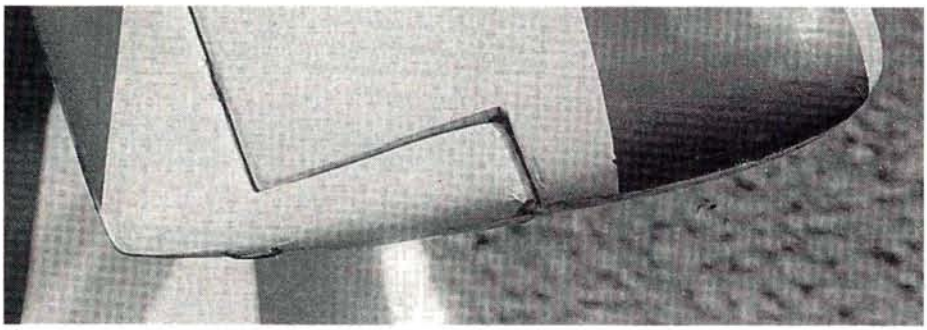
As many veteran free-flight and glider enthusiasts know all too well, a wing or a tail without control surfaces can



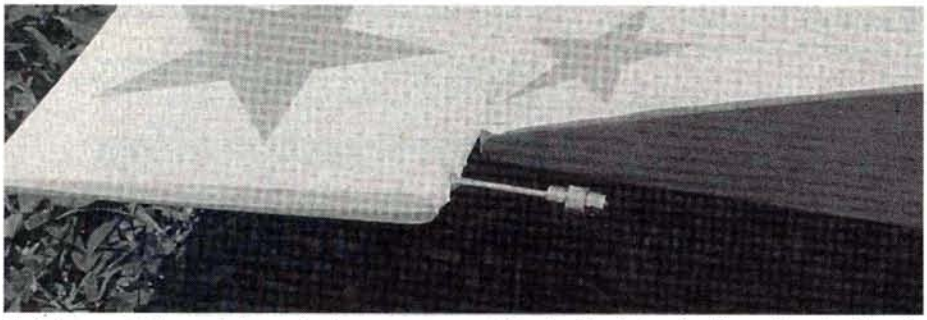
(Right) Some common flying-surface and control-surface arrangements are shown with suggested location and size of balance weights. The percent figure shown next to the balancers refers to the balance factor, i.e., the proportion of weight required to achieve full static balance (SB) of the control surface. Distances from the root end of the control surface (L) for mounting inboard balancers are also given.

Avoid use of excess balance weight. If flutter isn't completely cured by the suggested weights, try a second inboard-mounted balancer in addition to tip balancer. The referenced tapered wings & stabilizers have a 40% taper. If less taper is used on your design, use balancer weights closer to the constant chord suggestions (and vice versa).

get into serious flutter. Unbalanced control surfaces aren't the only cause of flutter. The best way to prevent full wing or tail flutter is to keep the structure torsionally stiff for its weight and to keep the wing or tail's center of mass as far forward as possible. Ideally, the center of mass should be at about the 25-percent chord point behind the leading edge. The ideal, as you might expect, is not very practical structurally, so good torsional stiffness has to do the rest.



4. A tip-mounted mass balancer can easily be faired into the wingtip.



5. A tip-mounted mass balancer is shown on a competition fun-fly airplane's aileron. By extending the weight forward, less weight can be used.

A gust bump will produce a force centered about the 25-percent chord point or thereabouts. If the mass center is behind this point, inertia will tend to twist the wing or tail to a higher angle of attack as it's bumped up, reinforcing the vibration in a similar manner to that of an unbalanced aileron. Helicopter blades are rather flexible in relation to the aerodynamic forces acting on them and usually need their center of mass close to the ideal 25-percent chord point to resist flutter.

It also helps to keep the structural shear center well forward. This is the point on the chord where application of a vertical load will result in the wing flexing up or down without twisting at the same time. If the shear center is behind the center of lift, the wing or tail will tend to twist to a higher angle of attack as lift is increased. Beyond a critical air speed, the increased angle of attack will result in more lift and more twist in a potentially deadly vicious circle, which is called "divergence." Keeping wing spars well forward helps to move the structural shear center and the mass center forward—both very important anti-flutter factors.

Birds have been in the flying game for a long time, and their wingtip, or primary flight feathers, are an example of anti-flutter design in nature. The primaries, which act like little independent wings, have the rachis (the feather's central stem, which functions like a spar) located at about the 25-percent chord point. This is in contrast to all the other feathers, which have the rachis in the center.

SHEAR WEBS AND STIFF COVERING

It's very important to keep the natural frequencies in bending and torsion high. This is achieved by using webbed, tapered spars; light wing and stab tips; and stiff covering. It helps to mount shear webs on the spars farther out on the span than is otherwise dictated by pure aerodynamic loading.

AIR MASS

Very light wings and tails, even if they are very stiff in relation to their weight, tend to suffer more from flutter, for a reason that caught some full-scale designers flat-footed. The air around, and even inside, a flying surface adds considerable mass to the equation. That mass tends to lower the natural vibrational frequencies of a wing. The mass of air influenced by a flying surface is typically about 15 to 20 percent of the mass of full-scale wing structures. In the case of a light model wing, that mass may be greater than the mass of the structure itself. In rigorous flutter analysis, the mass of the air is considered equivalent to the mass of a cylinder of air with a diameter of twice the wing chord (this air mass encompasses the entire wing). For example, for a 60-inch span and 10-inch chord wing, the air mass is approximately .8 pound. This mass is effectively added to the mass of the wing.

Use of structural materials that are very stiff in relation to their weight, e.g., carbon fiber, will help resist the effects of air mass, although it complicates construction and repair.

OPEN FRAMEWORK WINGS

Torsional stiffness, as I have mentioned, is important in model flying and control surfaces. An open-framework wing that flutters badly with plastic film covering may be fine with much stiffer silk and dope covering or one of the fabric-reinforced plastics. Plastic films also vary considerably in stiffness. Some of the films with low shrink temperatures are much more flexible and don't contribute nearly as much to the torsional stiffness of an open framework wing as do the stiffer films with higher shrink temperatures.

CONTROL SURFACE HINTS

Built-up, open-framework control surfaces can benefit from torsionally stiffer deodesic (egg crate) construction. Avoid using dense, hard balsa in solid wood control surfaces. Keep them light. Many World War II military aircraft were of sturdy all-metal construction, except for the control surfaces, where the low-weight requirement dictated the use of open-framework, fabric-covered structures. A heavy control surface needs a heavier mass balancer. This, in turn, increases aircraft weight, but far more important, it places more mass near the rear of the chord of the wing or tail. That rearward movement of wing mass center can by itself invite disastrous flutter, even with perfectly balanced control surfaces.

BIPLANES

On biplanes with four full-span ailerons, the interconnecting control link between the lower and upper ailerons should be placed as close to the fuselage as possible and kept as light as possible. (This assumes that you are using a torque-rod actuating linkage and strip ailerons.)

If barn-door ailerons are used and they're actuated by bellcranks and pushrods in the lower wing, the interconnecting links and

(Continued on page 109)

UGLY STICK

(Continued from page 96)

I installed the rest of the remaining hardware, i.e. wheels, control horns, etc., according to the instructions. I found too many wheel collars that fit the nose gear and not enough to fit the mains. I simply drilled out the collar to fit. I was also short one wheel-collar screw. My scrap box contained what I needed to complete the Stick. I set up the surface throws in the dual rate mode and TLAR (that looks about right) at full throw.

COVERING AND FINISHING

PVC covering material is factory-installed, so there is no covering needed. I carefully looked the Stick over for any uncovered wood areas. Only the inboard end of the ailerons lacked covering. I applied thin CA to fuelproof this area. I chose to install the hatch with silicone adhesive instead of the supplied screws. The silicone seals the hatch against exhaust residue. If I need access to the tank area, I can simply cut through the silicone with a razor blade. To finish sealing the Stick, I applied foam tape to the wing-saddle area.

The PVC covering material is unique. It's actually a tape with rather tenacious adhesive on the back. The instruction manual and supplemental sheet give instructions for "care and feeding" of the covering. You can expect the covering to go limp the first time the Stick is in the sun. This is addressed in the manual. I re-shrank the covering using a heat gun (the instructions are emphatic about not using an iron). After 10 minutes under the gun, the covering was tight as a drum again. Don't shrink the covering too much, as the edges will begin to pull away. Go ahead, ask me how I know!

With a discounted price of around $130 to $150 and less than 10 hours needed to get from the box to the field, this airplane, in my opinion, is a good value. It's "fast-building," strong and straight. The flight characteristics are smooth, stable and rock steady.

**Here are the addresses of the companies mentioned in this article:*
HD; distributed by Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign, IL 61821.
Airtronics Inc., 11 Autry, Irvine, CA 92718.
O.S., distributed by Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826.
Master Airscrew, distributed by Windsor Propeller Co., 3219 Monier Cir., Rancho Cordova, CA 95742.
APC, P.O. Box 938, Knights Landing, CA 95645. ■

SKYRAY

(Continued from page 73)

the mixture should be richened after the Skyray has established a positive climb. The nose-gear steering shouldn't be overly sensitive. Few steering inputs are required on a normal takeoff due to the wide track of the main gear.

The first flights should be conducted from a hard surface without drop tanks or other external stores. In this clean configuration, the Ford will virtually fly itself off the ground. At most, a slight nudge of back pressure can be used to coax the nose wheel off the pavement. The Skyray will rotate and hold a nose-high altitude for several yards before the main gear lift from the runway. It's possible to over-rotate the airplane, in which case the model will wallow into the air and climb with extreme difficulty. Take care to avoid excessive back pressure.

With the gear retracted and the model flying "on the step," the performance is very realistic. My models have never been run through speed traps, but I suspect that the straight and level speed at full throttle is in excess of 120mph. The climb performance is dramatic if you maintain energy, but the large delta wing absorbs power rapidly. The Skyray will loop easily from level flight, and large diameter loops look very impressive.

Rolls can be astonishingly fast. The model is clearly capable of roll rate faster

(Continued on page 108)

SKYRAY

(Continued from page 107)

than the full-size aircraft, so limit the roll input for a smoother, more realistic flight.

Landing the Skyray is deceptively simple. The pattern is begun with an overhead break at 100 feet. The power is reduced to 50 percent and the gear is extended. The downwind leg is flown with a slight nose-high altitude to bleed off some air speed. When the aircraft is approximately 50 yards downwind of the runway threshold, the power is brought back to 25 percent and the base leg is entered. Air speed and altitude are relinquished on this turn, and when the model is abeam of the runway it should have about 50 feet of altitude and carry a 10- degree angle of attack. This angle of attack is maintained throughout the final approach with power being used to control the rate of descent. Remember that the delta wing presents a large amount of drag at +10 degrees, so keep the engine spooled up. The Skyray should touch down with the nose wheel in the air. If you have maintained adequate air speed, the model will roll for several seconds before the nose wheel lowers to the runway.

Once you're familiar with the Skyray's flight performance, the drop tanks and other stores can be added.

SKYRAY

FUTURE DEVELOPMENT

There are several scale functions that I have yet to try on the Skyray. These include canopy actuation from the transmitter, speed brakes, wheel brakes and leading-edge slats. The Skyray used a slat system like the A4 Skyhawk's, which was sprung open and retracted under the air loads generated above a certain air speed. A functioning tail hook is also possible, but the weight of all of these options will lessen the model's performance.

There is a solution, however. The French Company J.P.X. Dropulseurs D'Aeronefs flew a true model turbojet at the 1992 Top Gun. This engine could be mounted easily in a Skyray fuselage, and once that little beauty is perfected, I have a home for it. Now, if I can only work out an afterburner with a modulating exhaust nozzle.... ■

FLUTTER

(Continued from page 102)

bellcranks should be close to the inboard end of the ailerons. Any weight behind the hinge line, particularly if it is significantly outboard of the wing root, is a bad thing. Some full-scale biplanes, e.g., the Pitts Special, have the aileron interconnecting links (between the lower and upper ailerons) ahead of the hinge line where, although they complicate construction, they also serve as aileron counterbalancers.

Pushrods with bellcranks mounted about halfway out on the wing panel are better for actuation of strip ailerons than the more common, simpler, inboard-mounted wire torque rods. The control pushrods provide very effective stiffening near the center of aerodynamic load.

TO BALANCE OR NOT TO BALANCE?

Many models fly reliably without balancers, while others of the same design will have serious flutter. This is probably owing to minor differences in mass and stiffness that can result from variations in balsa density. After several disastrous encounters with flutter, I don't take any chances. I use aileron and elevator balancers on everything I build. I would omit balancers only on very slow flying models.

The illustration shows a number of common control-surface layouts and recommendations for damper weights. Weights are given as balance factors—a percentage of the weight needed to produce static balance. These should fix flutter where the common wingtips flapping in phase mode (fundamental) is the culprit. Many of the suggested balance factors are a little on the low (safe) side, and thus unlikely to excite or reinforce the destructive higher frequency vibration

(Continued on page 115)

FLUTTER

(Continued from page 109)

modes. Where higher harmonics are present, additional inboard-mounted balance weights may be required, as shown on some of the diagrams.

The fixes discussed here have worked on every model I've encountered with a flutter problem thus far. Although nature has a way of humbling all of us from time to time, the techniques I have described should go a long way toward flutter-proofing your models. ■

AIRWAVES

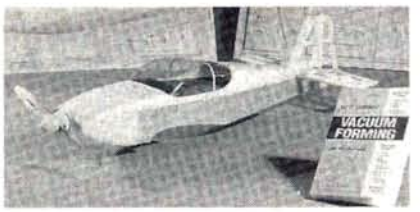
(Continued from page 23)

that you need to consider is at the touch of a button. Everything from doorways and door-swing areas to the position of electrical outlets and overhead fixtures is represented.

When you've finished, the sales-person pushes a button and out comes a blueprint, a bill of materials and a price quote. You only have to supply the measurements of the room and a rough sketch of the window, door and/or stairway positions. The salesperson usually also has a good understanding of what a workshop's dimensions should be. Things like bench height for sitting or standing, wall height for shelves and the best types of overhead lighting all affect the atmosphere and efficiency of a workshop.

So if you've tried already but don't like what you've done, jot down your likes and dislikes, measure your room's dimensions and head to the professionals. In many cases, if you buy the materials for your project at the center, the computer-plans service is free. If you're looking for some tips on which tools to put in your shop, read Frank Tiano's "Sporty Scale" column in our March '91 issue. Good luck! GY

PRODUCT NEWS



VACUUM FORM
"Vacuum Forming"

Now in its third printing, this comprehensive book on vacu-forming contains new information on how to create a more powerful vacuum by using a vacuum cleaner and a $5 part from the hardware store. The power is enough to form plastic as thick as 3/16 inch and even difficult Lexan parts. Information on how to make simple clamp frames and how to choose the right plastic is also included, along with plenty of photos, tips and examples.

Price: $9.95 (plus $1.05 S&H).

Vacuum Form, 272B Morganhill Dr., Lake Orion, MI 48360; (800) 737-3000.

MIDWEST PRODUCTS
Easy Trim Stars

Midwest Easy Trim offers a quick way to decorate your R/C sport model and make your plane more visible in the air. Simply apply these large, pressure-sensitive, fuel-resistant graphics over an iron-on or painted finish. There are 120 die-cut stars on an 11½ x 26-inch sheet, and you can pick from six patterns. No cutting needed; just peel and stick!

Price $9.95

Midwest Products Co., 400 S. Indiana St., P.O. Box 564, Hobart, IN 46342; (219) 942-1134.

SIG MFG.
Four-Star 120

The new Sig Four-Star 120 is perfect for sport modelers who want a large plane that can be built like a small one. The lite-ply fuselage and simple wing design let you zip through construction. The 120's large size makes aerobatics smooth and landings incredibly soft and slow, and it can be built just like the popular Sig Four-Star 40.

Kit no. RC-65

Price: $179.95

Sig Mfg. Co., 401-7 South Front St., Montezuma, IA 50171; (515) 623-5154.

RJL INDUSTRIES USA
Forster .99 Engine

The Forster .99 ignition engine first appeared on the market in 1936 and was sold throughout the 1950s. This vintage engine has a ball-bearing crankshaft, a bronze-bushed connecting rod and a two-speed timer that allows low/high speeds by retarding the spark timing. This well-known favorite produces .68hp and swings a 14- to 16-inch propeller with ease. Specifications: bore—1.0625 inches; stroke—1.125 inches; displacement—.99 inch; compression—8:1; weight—14 ounces. The Forster .99 comes with a one-year warranty.

Price: $289 (plus $3.50 S&H).

RJL Industries, P.O. Box 5, Sierra Madre, CA 91025; (818) 359-0016.

KDI
Vinyl Wheel Pants

Light, beautiful and guaranteed not to break, these pants can withstand the worst landings. Specifically designed for Goldberg Ultimates, Extra 300s and Chipmunks, these pants will fit any plane that has 3-inch wheels. Buy the complete pant or the protective vinyl cover that slips over the pant. Available in MonoKote White, Bright Red and Yellow.

Price: $29.95/pair; $14.95/pair (covers only).

KDI, 10426 SE 206 Pl., Kent, WA 98031; (206) 854-8053 (after 4 p.m., Pacific Time).

WAHL CLIPPER CORP.
Iso-Tip Butane Soldering Iron & Torch Kit

This multi-purpose, portable tool can be used as a soldering iron with tip temperatures of up to 1,067 degrees Fahrenheit and as a torch with temperatures of up to 2,372 degrees Fahrenheit. The hot blower tip can be used for heat-shrink tubing and for heating plastics until they're pliable. A wide variety of tips and accessories is also available.

Price: $54.95 (kit); $29.95 (iron with attachment).

Wahl Clipper Corp., 2900 North Locust St., P.O. Box 578, Sterling, IL 61081-0578; (815) 625-6525.

PRODUCT NEWS

COVERITE
21st Century Fabric

You can achieve a realistic scale appearance with 21st Century's painted, fuelproof fabric. Stronger and more durable than any film on the market, it can be ironed over itself as trim (without creating air bubbles). Available in 10 colors and two sizes: 27x72 inches and 27 inches x15 feet.

Price: $20.95 (small); $52.38 (large).

Coverite, 420 Babylon Rd., Horsham, PA 19044; (215) 672-6720.

IKON N'WST
Landing Gear

Although this landing gear was manufactured exclusively for Ikon's ⅕-scale J-3, PA-11 and Super Cub and its ¼-Scale Super Cub, it will also fit other planes. You can bolt on the gear by drilling through the existing mount. This durable steel landing gear is welded and bolted together.

Price: $90 (¼ scale); $80 (⅕ scale)—plus $5 S&H.

Ikon N'Wst, P.O. Box 306, Post Falls, ID 83854; to order: (800) 327-7198; information: (208) 773-9001.

HOBBY SUPPLY SOUTH
Model Engines Vol. I Video

Model Engines Volume I is the first in a trilogy of videos. All aspects of 2-stroke engine selection, installation, operation and maintenance are covered. Computer graphics and animation are included in this in-depth look at model powerplants.

Price: $24.95

Hobby Supply South, 5060 Glade Rd., Acworth, GA 30101; (404) 974-0843.

Descriptions of products appearing in these pages were derived from press releases by the manufacturers and/or their advertising agencies. The information given here does not constitute endorsement by **Model Airplane News**, nor guarantee product performance. When writing to the manufacturer about any product described here, be sure to mention that you read about it in **Model Airplane News**.

NAME THAT PLANE

CAN YOU IDENTIFY THIS AIRCRAFT?

If so, send your answer to *Model Airplane News*, **Name That Plane Contest** (state issue in which plane appeared), 251 Danbury Rd., Wilton, CT 06897.

Congratulations to Allen W. Hayes of Alexandria, MN, for correctly identifying the January '93 mystery plane. Of the 92 entries, only four correctly identified the Douglas C-7 Globemaster. Though the Douglas C-74 Globemaster I (the military version) was widely recognized by our readers, we wanted its original designation of C-7 as produced for Pan American airlines. This plane, serial no. 265402, was the first of the14 that were built.

The Douglas C-7 Globemaster had a 174-foot wingspan and was 130 feet long. Four Pratt & Whitney R-4360, 28-cylinder, 3,500hp engines powered the plane, which could stay airborne (lightly loaded) for about 18 hours. The two "bug-eye," fighter-type canopies were later replaced with a conventional flight deck and a cabin for the three-man crew. It could carry more than 100 passengers, or about 55,000 pounds of cargo.

The aircraft later included two cargo decks inside the fuselage. It was designated the C-124 Globemaster II, and it could carry 200 passengers. ■

The winner will be drawn four weeks following publication from correct answers received (on a postcard delivered by U.S. Mail), and will receive a free one-year subscription to **Model Airplane News.** If already a subscriber, the winner will receive a free one-year extension of his subscription.

CLUB OF THE MONTH

SOUTH ALABAMA R/C MODELERS (SARCM)
The Fly Paper
9408 Clarke Ridge Rd. Foley, AL 36535

The January issue of the "The Fly Paper"—SARCM's newsletter—begins with a thought-provoking passage on breaking rules: "The rule-breaking (?) club safety officer recently demonstrated to a rule breaker (?) what can happen if two people break the rules at the same time. He accidentally rammed the front of his landing plane into the tail of the rule breaker's (?) plane. The engine of the rammed plane had sagged during takeoff and was being adjusted out on Irwin field. Is that clear? If it is, who is guilty and of what?"

As well as provoking a smile, like other comments in the newsletter, this passage underscores an appropriate concern with safety. In an article on safety procedures, editor Bill Haywood notes: "When a modeling-related accident occurs, we are *all* to be found guilty in some way for that accident. Whether the accident is large or small, does permanent damage or just inflicts a scratch, we probably could have helped prevent that accident." Bill then reiterates the basics procedures for starting engines and avoiding the prop. Another article looks at field courtesy.

We applaud the emphasis on safety and courtesy. This approach helps individual modelers and the perception of modeling outside the sport.

We hope SARCM enjoys its two free subscriptions! ■

CLASSIFIEDS

RATES: non-commercial— 25 cents per word. No charge for name and address (no commercial ads of any kind accepted at this rate.); commercial— 50 cents per word (applies to retailers, manufacturers, etc.); count all initials, numbers, name and address, city, state, zip code and phone number. **All ads must be paid for in advance.**

To run your ad for more than one month, multiply your payment by the number of months you want it to run. Deadline: the 10th day of the month, e.g., *January 10 for the April issue.* We don't furnish box numbers, and it isn't our policy to send tear sheets. **SEND AD AND PAYMENT TO: CLASSIFIED ADS, Model Airplane News, 251 Danbury Rd., Wilton, CT 06897.**

R/C WORLD—ORLANDO, FL, CONDO RENTAL—2 bedroom, furnished. Available weekly or monthly. Low rates, 100-acre flying field with enclosed hangar. Swimming pool, tennis courts on site. Minutes from Disney World and Epcot Center. For information, call Micki at (800) 330-7243 or (407) 260-1252; fax (407) 331-3867; or write to: Page One Management Realty Inc., P.O. Box 4732, Winter Park, FL 32793-4732.

OLD-TIMERS, take a ride back in time to airplane modeling roots with this vintage book—*Gas Models.* A true collector's book from the early editors of *Model Airplane News*, it contains the best of modeling from the '30s and '40s, including great technical information and classic construction articles from the Golden Age period. $7.95, add $3 S&H for first item; $1.50 for each additional item. *Foreign:* (including Canada and Mexico)—*airmail*, add $7.50 for first item, $4.00 for each additional item. Payment must be in U.S. funds drawn on a U.S. bank, or by international money order. (Connecticut residents add 6% tax; Canadian residents add 7% tax.) Air Age Mail-Order Service, 251 Danbury Rd., Wilton, CT 06897.

VACUUM FORMING—Now in its third printing, the most comprehensive book on vacu-forming ever published for the hobbyist. 128 pages of hands-on information show how easy it really is to make your own plastic parts. Includes exclusive information on an easy-to-build 2-stage vacuum system for truly professional results. It's easy! Try It! $9.95 + $1.05 postage. Vacuum Form, 272B Morganhill Dr., Lake Orion, MI 48360; (800) 737-3000. $1 surcharge for Visa/MC. [5/93]

WANTED: Model engines and race cars before 1950. Don Blackburn, P.O. Box 15143, Amarillo, TX 79105; (806) 622-1657. [5/93]

WANTED: your old proportional radios; interested in pre-1980, American made; C&S, Deans, Klinetronics Spar and others. Older is better. Ron Gwara, 21 Circle Dr., Waverly, NY 14892; (607) 565-7486. [9/93]

WANTED: Old, unbuilt, plastic model kits. Planes, military, figures, cars, promo. Aircraft or missile desk models. Send list, price. Models, Box 863, Wyandotte, MI 48192. [9/93]

ANTIQUE IGNITION AND GLOW PARTS CATALOGUE: 100 pages—timers, needle valves, original cylinder heads, point sets, drive washers, stacks, spark plugs, plans. Engines: Atwoods, Baby Cyclones, McCoys, Hornets, others. $8 postpaid, U.S.; $20 foreign. Chris Rossbach, R.D. 1 Queensboro Manor, Box 390, Gloversville, NY 12078. [8/93]

MAGAZINE BACK ISSUES—Flying Aces, MAN, Air Trails, 1930s and '40s. FM, RCM and more. Send SASE for list to: Carolyn Gierke, 1276 Ransom Rd., Lancaster, NY 14086. [8/93]

GIANT-SCALE PLANS by Hostetler. Send SASE to Wendell Hostetler's Plans, 1041 B Heatherwood, Orrville, OH 44667. [10/93]

WANTED: model airplane engines and model race cars made before 1950. Jim Clem, 1201 E. 10, P.O. Box 524, Sand Springs, OK 74063; (918) 245-3649. [6/93]

WANTED: Built or partially built Ercoupes, Mooney M-10 Cadets, or Cessna 150, 152, 172, 182. Glen Mills, P.O. Box 3393, Mission Viejo, CA 92690; (714) 768-0585. [10/93]

WANTED: Original kit form, circa 1968-1970, "Schoolmaster" by Top Flight. Barbara Blythe, 484-B Washington St., Suite 341, Monterey, CA 93940; (408) 372-7586. [6/93]

WANTED: Original kit form, circa 1960-1963, Eindecker model, free flight or R/C. Barbara Blythe, 484-B Washington St., Suite 341, Monterey, CA 93940; (408) 372-7586. [6/93]

WANTED: model rocket catalogues, magazines, certain rocket kits and engines (1958 to 1975) from Estes, Centuri, Model Missiles, Vashon, Coaster. Art Nestor, 230 Arthur St., Zelienople, PA 16063. [6/93]

THREE THOUSAND-plus old-time plans, rubber gliders, three-views, CL, R/C, boats. Largest illustrated catalogue available—$4. Refundable. Allen Hunt, P.O. Box 726 C, Dunbar, WV 25064-0726. [5/93]

CAD-DESIGNED, Space Shuttle mailbox prints—$14.86; ceramic jumbo-jet birdhouse—$24.95. Hangar 18 Reproductions (Dept. ma), P.O. Box 153, Chelsea, OK 74016. [8/93]

HELICOPTERS. New, used, buy, sell, trade, build, repair, parts and teach. Best prices around! Hobbies Unlimited (817) 295-5003; Burleson, TX. [4/93]

DISPOSAL—Over 50-year aviation collection: slides, photos, negatives, three-views, documentation material. No list; sent wants and SASE to Dustin Carter Aviation Collection, P.O. Box 2114, Valley Center, CA 92082; (619) 742-1783. [4/93]

PLANS ENLARGED—Scanning/plotting services; CAD/printer plotter software. Free information. Concept, P.O. 669E, Poway, CA 92074-0669; (619) 486-2464. [4/93]

FROSTING ON THE CAKE! The best "stick-on" graphics anywhere! Spice up your next ho-hum covering job with these eye-catchers! Free catalogue. Silicon Valley R/C Technologies: (800) 822-1500. [6/93]

NONE BETTER in the universe! The best VHS flight-instruction tapes available anywhere! Silicon Valley R/C Technologies: (800) 822-1500. [6/93]

ARF KITS—Ryan-style design; 52" and 72" wingspan. For information, write to Design Consultants, P.O. Box 2189, Culver City, CA 90231. [7/93]

2-INCH WINGSPAN! New tiny planes fly great! Across your desk; across the yard! Original, high-quality, miniature paper airplanes! These tiny planes weigh 1/10 gram; come three to a kit—$3.98, post-paid. Specify Vee-Tail, Straight Tail, Canard, Twin-Fin Canard, Delta or any three. Send check or money order to Tiny Planes, Dept B, P.O. Box 1764, Grants, NM, 87020. [3/93]

ROCKETRY SECRETS—Engines, missiles, U-Build. $2. Northstar-A3, 813 Cherry Ave., Albany, GA 31701. [3/93]

GEE BEE plans used for Benjamin's R-2 (1/4 scale, etc.). Plans catalogue/news—$3.25 (refundable). Vern Clements, 308 Palo Alto, Caldwell, ID 83605. [5/93]

SCALE AIRCRAFT DOCUMENTATION and RESOURCE GUIDE. World's largest commercial collection. 4,000+ different color Foto-Paaks and more than 22,000 three-views. Catalogue—$5 ($10 foreign). Scale Model Research, 2334 Ticonderoga Way, Costa Mesa, CA 92626; (714) 979-8058. [8/93]

WANTED—World War II and postwar recognition models. Old toy airplanes, cars, trucks, Zepplin, etc. Bill Fornwalt, 103 Dartmouth Ave., Johnstown, PA 15905. [11/93]

INTERNATIONAL AIRCRAFT RESEARCH. Need documentation? Include name of aircraft for availability of documentation with $3 for three-view and photo catalogue. 1447 Helm Ct., Mississauga, Ontario, Canada L5J 3G3. [6/93]

QUIET YOUR ENGINE with Koosh-In-It—a flexible, rubber-fabric laminate that "softens" engine vibration. Install it between the engine, engine mount and/or firewall. Pad measures 2 1/2x4 inches and is 1/16 inch thick, and it can be cut easily with blade or scissors. Only $5.80, postage-paid. Balsadust, P.O. Box 078, New York, NY 10021-0078; (212) 737-0071. [7/93]

AVIATION FINE ART. All the current limited-edition prints by top artists—Taylor, Trudgian, Dietz, Grinnell, more. Many signed by top aces. Satisfaction guaranteed. Order today—Visa/MasterCard—(800) 522-6111. Free newsletter: write to Air Art Northwest, 846 South Ginger, Suite 120, Cornelius, Oregon 97113. [4/93]

BUDGET FLIGHT BOX. Compact, 1,620-cubic-inch volume holds: gallon of fuel, starter battery, starter, tools, spare props, parts, transmitter, first aid, etc. Handle folds and box serves as low-profile table stand for models 1/2A through 84 inches. Sig SR plans, only $4 PPD; kit—$12, plus $5.50 S&H. A. Chen, P.O. Box 4213, Irvine, CA 92715. [7/93]

SCALE DOCUMENTATION: PLAN ENLARGING. 140 super-scale, sport and giant R/C construction plans, three-views, cut-away drawings. Over 100,000 documentation photos in stock; 120-page catalogue—$5 ($10 overseas airmail); Visa/MasterCard. Jim Pepino's Scale Plans and Photo Service, 3209 Madison Ave., Greensboro, NC 27403; (919) 292-5239). [5/93]

IMPORTED DIESEL ENGINES. World's best selection: AE, AM, Aurora, Cipolla, KMD, MAP3, Mikro, MK-17, MVVS, Modela, PAW, Pfeffer, Letmo and USE diesels, plus very special imported glow engines, CO_2 motors and sailplane kits. Ten-page catalogue—$1. Carlson Engine Imports, 814 E. Marconi, Phoenix, AZ 85022-3112.

P/C—THE EASY WAY to simulate metal panels; $1 gets information and sample. Clarke Smiley, 23 Riverbend Rd., Newmarket, NH 03857. [6/93]

HOW-TO ARTICLES WANTED

Do you have a construction technique, building method, or design innovation that you'd like to share with readers? Why not publish your ideas in *Model Airplanes News?* For more information, contact editor-in-chief Tom Atwood.

EDITORIAL

(Continued from page 6)

from building and operating radio controlled models," or "I am an active competitor in local, national and international events," or "As a student, I learn valuable lessons from building and operating models," or "I am active in our local club."

3. Indicate your financial involvement: "I own ___ pieces of radio equipment that would be unusable if this frequency assignment is adopted" or, "My hobby-shop business involves ___ percent radio-control sales."

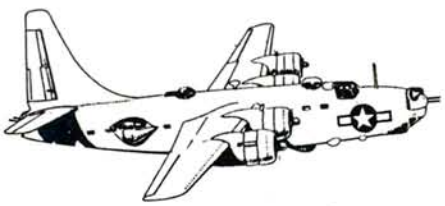
4. Strongly stress the safety and liability aspect created by the proposal! "The models I build weigh as much as ____ pounds and fly at ___mph," or "Our club operates at a public park," or "Since the proposed new frequencies are so close, interference will occur and render most model frequencies unusable."

The *best* approach is a letter written by you to the government official(s) involved. The second level of effectiveness is a signed form letter. The *least* effective communication is a petition simply signed by individuals. (This approach is not recommended.)

Many people—not just those who actually build and operate models—derive enjoyment from our hobby/sport. Ask them to write and indicate their concern!

The most important thing to remember is act now!

For additional information, contact the Technical Department at AMA Headquarters—(703) 435-0750, ext. 264. ■



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